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ABSTRACT

The document presents eight papers dealing with educational administration in developing nations. It is intended to aid UNESCO staff members and other educational advisors as they collaborate with policy makers in developing nations to improve educational programs. Written by staff members of UNESCO's Division of Educational Finance, the papers reflect concerns expressed by educational and governmental authorities in developing nations regarding major policies, plans, and priorities for their national educational systems. The practical problems and theoretical issues were identified by UNESCO staff members during 74 fact-finding missions to developing nations conducted from 1965 to 1975. Sample topics focus on ways of projecting annual entrants to primary school; characteristics of educational institutions in Denmark, West Germany, Great Britain, and Sweden; technology in the general education curriculum; integration of science and technology in junior high and senior high schools; vocational education for students in the least developed nations; space requirements and teacher needs required by various educational methods; rural educational development; and identification and selection of educational development projects which will receive funding from UNESCO and other international organizations. (DB)

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Educational Development
Some practical issues

Documents prepared by members
of the Division of Educational Financing

Le développement de l'éducation
Quelques questions d'ordre pratique

Documents établis par des fonctionnaires
de la Division du financement de l'éducation

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Unesco 1976

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INTRODUCTION[1]

This second volume of papers on practical problems and issues in developing education is prompted by the good reception given to the first volume.[2] The audience intended is the same, primarily, Unesco staff at headquarters or in the field, working on programmes or projects to assist governments in their task of improving their educational systems. It is hoped, however, that as with the first volume, some of the papers will be of interest to a wider group.

With the exception of two papers, the contributions have their origin in practical problems or theoretical issues arising during the course of missions carried out by the staff of the Division of Educational Financing to assist governments in the identification and preparation of projects for external financing by IBRD/IDA. They may even be a response to a local request for more detailed information and advice on a given problem. This accounts for the wide diversity of topics treated. The variety of local situations precludes the use of concrete examples in full detail, hence, the papers vary considerably in their level of abstraction. The underlying purpose has been to discuss problems common to many countries and to share experiences. Although endogenous development is the fashionable concept, the comparative approach retains its usefulness, if only to help prevent the repetition of errors.

The last paper of the present volume was prepared in the course of a general review of the Co-operative Programme between the IBRD/IDA and Unesco. The programme has now been in reasonably successful operation for more than 12 years so that a stock-taking was appropriate. It is included to give an indication of the range and diversity of projects financed as well as of the scale of eventual operations.

All the papers, except that by H.A. Foecke, have been written by staff members of the Division of Educational Financing. Mr. Foecke's paper was written for staff discussion within the Division. The papers were edited by Mr. W.L. Taylor, also a member of the Division of Educational Financing.

1/ By Mr. W. Moller, Director of the Division of Educational Financing.

2/ "Educational Development - Some Practical Issues", Occasional Paper No. 1; Division of Educational Financing, Unesco, 1975, Ed. 75/WS/65.

A METHODOLOGY FOR PROJECTING ANNUAL ENTRANTS TO THE FIRST GRADE OF PRIMARY EDUCATION LEADING TO UNIVERSAL PRIMARY EDUCATION

by

J. Chesswas

A METHODOLOGY FOR PROJECTING ANNUAL ENTRANTS TO THE FIRST GRADE OF PRIMARY EDUCATION LEADING TO UNIVERSAL PRIMARY EDUCATION

Introduction

1. Many developing countries have a target of universal primary education by a specified year. At first sight it might seem that this simply means that all children of the official age-range of primary education should be in primary schools in that year. Unfortunately, as educational planners know, the real situation is much more complicated, and for projections of enrolments to be made on which to base the provision of physical facilities, teachers and finance, certain phenomena must be analysed and their future behaviour projected. Among the most important of these phenomena are the two following categories:

(a) Ages of entry to Grade I. Although there is usually an official age of entry to primary school, in virtually every country there is a little under-aged entry and considerable late entry at ages a year or so above the official age.

(b) Flows through and out of primary education. There is much repeating and drop-out in primary education, and rates are often high in the lower grades.

As a result there are many over-aged children in primary education, and relating total primary enrolments to the population of the official age-range for primary education gives a false picture.

2. When an educational planner is faced with the task of planning the approach to universal primary education, one of the basic decisions to be made is the interpretation of this objective into a sufficiently precise definition for him to formulate a methodology with which to make projections. In so doing he needs to take into account possible realities. In spite of the policy, there may still be drop-outs in the future and children who do not complete primary education; there may still be repeaters and hence children who will still be in primary school over the official age. The political decision-makers may have to be persuaded to face up to these possibilities and to approve an interpretation of the policy as one of attempting to obtain full entry into primary education and reduction of the above defects as far as possible.

3. This paper addresses itself to a methodology which could be used for projecting entry. The steps in the methodology are illustrated by the case of the national figures for Zaire, which were used in a recent Unesco report, but it should be emphasized that projections of this nature should be made at a sub-national level, regional, provincial, district, or whatever the politico-administrative structure of the country, as it is common to find wide disparities in provision of primary educational services between urban and rural areas and between different rural areas, and the problems of the approach to universal primary education are usually different in various parts of the same country.

4. Before dealing with the methodology of this first aspect of the approach to universal primary education, the opportunity is however taken of making a few comments on the second, flows through and out of primary education, as the methodology of the one is useless without that of the other. The second is probably the more difficult. Recent flow trends should first be analyzed to show their nature and magnitude, and to indicate where further investigation should be undertaken. This investigation should concentrate on the causes of the phenomena, which are likely to be a mixture of social, economic, educational and cultural factors, often impinging on one another. Proposals should be made as to how these causes should be tackled, itself a difficult task, followed by the even more difficult task of projecting how the proposed action may affect the flow rates, which can only be an intelligent guess.

5. A final introductory point. These methodologies are concerned with numerical projections and, in addition to the hazards discussed above, there are also the doubts about the reliability of the basic data, educational, demographic, and economic, and of the conclusions to be drawn from the analysis of them. This is a world-wide problem for all methodologies dealing with human behaviour, and is well known to specialists engaged on them; but the warning must be repeated when a methodology is presented.

Projection of Number of Entrants: General Remarks

6. In addition to being realistic about the possible future behaviour of observed phenomena, discussed above, the planner must also take into account Government regulations about entry and the likelihood of their being either observed or enforceable. A common situation is that of a country which may have a fairly high national entry rate, but with low rates for some areas, especially for girls. The desirability and possibility of persuading or compelling parents to send their children to school should be considered, decisions and assumptions made on the resultant effects, even to the extent of possibly postponing the target date of achievement of universal primary education for some groups, and both entry and flow rates for the individual groups projected in as realistic a manner as possible. This re-emphasizes the need to plan by sub-national areas and by sex. Entry and flow rates may well differ for each group.

7. To turn to the case of the example to be used for the illustration of the methodology: national figures for Zaire. The Government has a target of universal primary education in 1980; the latest educational statistical data available are those for 1972/73, with a time series back to 1968/69. The official rule is that the age of entry to primary education is 6 years, but that boys may enter up the age of 8, and girls to the age of 9. As is shown below, there is evidence that boys also have been entering up to the age of 9. The educational statistics used are those collected annually by the Ministry of Education, and the population estimates were made by the Institut national de la statistique for the Bureau du Président on the basis of the 1970 census, assuming a steady fertility rate for women aged 15 to 45 up to 1980 and a steadily decreasing mortality rate.

Basis of the Methodology

8. The methodology is based on an analysis which follows the enrolment ratios, year by year, of a cohort of children born in the same year, which is summarized in Annex I.1/ For instance, the boys born in 1961 were 7 years old in 1968; the population was 290,000, of whom 214,000, or 73.8%, were enrolled. In 1969 they were 8 years old; the population had dropped to 289,000, of whom 229,000, or 79.2%, were enrolled, an increase in both number and percentage. In 1970, at 9 years old, the population had dropped to 288,000, of whom 239,000, or 83.0%, were enrolled, again an increase in both number and percentage. In 1971, at 10 years old, the population had dropped to 287,000, of whom 247,000, or 86.1%, were enrolled; again an increase in both number and percentage. In 1972, at 11 years old, the population had dropped to 286,000, of whom 225,000, or 78.7%, were enrolled, a drop in both number and percentage for the first time. Thus enrolment of this cohort came to a peak in 1971 at the age of 10. There was clearly still entry up to that age. There may have been some entry afterwards, more than counter-balanced by drop-out, but the data are not refined enough to give this information.

9. Unfortunately the available time-series is not long enough to follow complete cohorts through from the age of 5 to 12, but Annexes II and III, which group percentage enrolment ratios at each age-point on the basis of Annex I, give an indication of how cohorts have behaved in general. It would appear that the 1961 boys' cohort discussed above was a little untypical, in that the general peak point is around the ages of 8/9, at nearly 90%, that for girls being around the same ages at about 60%.2/

10. The methodology projects these phenomena to a base year, which in the case of Zaire is 1975, since, if universal primary education is to be achieved in the 6-grade primary course in 1980, every child reaching the age of 6 in the years 1975 to 1980 inclusive must enter primary school.3/ The projection of the age-specific enrolment ratios in 1975 gives an indication of those who are not enrolled and thus the maximum numbers of over-aged children to be admitted after 1975. When

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1/ A refinement of the methodology would be to use ages of entrants, but since such statistics are not normally collected, the methodology is based on ages of students enrolled, which more and more countries are now collecting.

2/ It is, incidentally, interesting to note what happens after the peak. Boys seem to hold up quite well to the age of 12, but girls drop off after the age of 10.

3/ For the purpose of illustrating the methodology, the possibility of special education for handicapped children is ignored. If this is to be provided, then entrants to ordinary primary schools will be a little less than 100% of the corresponding population; this does not affect the principles of the methodology.

these are added to those reaching the age of 6 from 1976 to 1980 inclusive, the aggregate is the maximum total to be admitted in the years 1976, 1977, 1978, 1979, and 1980, which can then be distributed progressively among those five years.1/

Step 1 - Projections of Entrants in 1975

11. The numbers of girls entering Grade I from 1968/69 to 1972/73 were as follows:

Year	No. of entrants	Percentage growth rate
1968/69	209,523	18.1
1969/70	247,515	14.7
1970/71	283,801	4.9
1971/72	297,591	1.4
1972/73	301,612	9.5 average

Source: Compiled from Annuaires statistiques de l'éducation, 1968/69 to 1972/73.

The population aged 6 is projected to grow, between 1972 and 1975, from 332,000 to 360,461,2/ which gives an average annual growth rate of 2.8%.

12. Two alternative assumptions for the rate of growth of entrants from 1972 to 1975 are taken:

1. at the same rate as population;
2. at the average rate observed for 1968/69 to 1972/73.

These result in entrants in 1975, rounded, of 327,000 for alternative 1, and 396,000 for alternative 2, which are 90.7% and 109.9% respectively of the projected population aged 6.

Step 2 - Calculation of Backlog of likely over-aged Entrants after 1975

13. On the basis of the discussion, in paragraphs 8 and 9, of the analysis in Annexes I to III, it is assumed that there will continue to be entry up to the age of 9 but not beyond. If there is entry after that age, it will probably be small. and might be partly compensated by the possibility that not all aged 7, 8 or 9 will enter.

1/ The calculations used to illustrate the methodology are those for girls in the whole of Zaire.

2/ Perspectives démographiques provisoires pour la République du Zaire, 1970-1980, Bureau du Président, Planification du Développement, avec la collaboration de l'Institut national de la statistique, Kinshasa, le 6 avril 1972.

14. Thus the backlog of likely over-aged entrants after 1975 is assumed to be those aged 6, 7 and 8 in that year who are not in school. The calculation is made on the basis of projections of the percentages of the population of each age enrolled in 1975. The backlog will be the difference between the population and those enrolled in each case. It should be noted that it is projected that all children aged 7, 8 and 9 in 1976 who had not previously been admitted will enter. It is possible that some will not, and the projections should therefore be considered as maxima. However, the announcement in 1975 of the target of universal primary education in 1980 having been made as a matter of high priority in the Government's policy, it is likely that this may give a stimulus to entry at these ages. Since there is a little under-aged entry, it is also necessary to calculate those aged 5 in 1975 who are not in school; these are children of the correct age of entry, 6, in 1976.

15. There seems to be a general small upward trend in the percentages of populations enrolled in Annexes I, II, and III. However, the variations are such that it is probably better to use the averages of the five percentages for each age as the bases for projections. These averages are as follows:

Age 8: 57.3% - age 7: 54.0% - age 6: 36.2% - age 5: 3.5%

Alternative 1

16. Since entrants are projected to grow with population, it is assumed that percentages of each age enrolled will remain the same. In detail this will probably not be true, but since the methodology is interested in the final aggregate and not the details making up the aggregate, this is likely to be a case of "swings and roundabouts" and for the purpose of the methodology the assumption is reasonable. Thus the calculation of the backlog is as follows:

Year of birth	1975				
	Age	Population (000s)	Enrolment ratio	Enrolled (000s)	Not enrolled (000s)
1967 1/	8	332	0.573	190	142
1968	7	345	0.540	186	159
1969	6	360	0.362	130	230
1970	5	378	0.035	13	365
Total backlog (including 6-year-olds 1976)					896

1/ This cohort will be 9 years old in 1976.

Alternative 2

17. Since the enrolment ratio is related to population, the rate of growth of population must be subtracted from that of entrants to get an estimate of the rate of growth of the enrolment ratios. This is 9.5 - 2.8, or 6.7%. Thus each of the base enrolment ratios analyzed must be multiplied by $(1.067)^3$ to obtain the growth in the enrolment ratios between 1972 and 1975. The comment on details and aggregates made above applies equally here. The calculation of the backlog is:

Year of birth	1975				
	Age	Population (000s)	Enrolment ratio	Enrolled (000s)	Not enrolled (000s)
1967 1/	8	332	0.696	231	101
1968	7	345	0.656	226	119
1969	6	360	0.440	158	202
1970	5	378	0.043	16	362
Total backlog (including 6-year-olds 1976)					784

Step 3 - Projection of the Total to be Admitted from 1976 to 1980 Inclusive.

18. The projections made in the Perspectives démographiques pour la République du Zaire of girls reaching the age of 6 are as follows (rounded):

1977: 389,000 - 1978: 404,000 - 1979: 419,000 - 1980: 435,000

Total: 1,647,000. Thus the total to be admitted from 1976 to 1980 inclusive for the two alternatives is as follows:

(in 000s)

	Alternative 1	Alternative 2
Backlog (including those reaching age 6 in 1976)	896	784
Those reaching age 6 in 1977 to 1980	1,647	1,647
Total	2,543	2,431

The difference between the two alternatives is only 4.6%, but the backlog of those aged 7 to 9 in 1976 is 21% and 17% of the respective totals, showing how important it is to bear it in mind in making projections.

1/ This cohort will be 9 years old in 1976.

Step 4 - Distribution of total Entrants by Year of Entry

19. The methodology does not project the proportions of each age-group who will enter each year. It is neither possible nor necessary. All that is required is to project a number to enter each year from 1976 to 1980, with a total equal to that projected in Step 3. In each case the projected entry in 1975 is the starting point. The distribution can be made arbitrarily either arithmetically or geometrically. This is illustrated by the following calculations for Alternative 2: (in 000s).

Arithmetical

20. The entry in 1975 is 396. This grows annually for 5 years by x to total 2,431. Thus:

$$(396 + x) + (396 + 2x) + (396 + 3x) + (396 + 4x) + (396 + 5x) = 2,431$$

$$x = 30$$

Hence intakes will be as follows:

1976	426
1977	456
1978	486
1979	516
1980	546
Total	2,430

Geometrical

21. If intakes are multiplied by r annually, then the total of the five years' intakes will be:

$$396 \times \frac{r(r^5 - 1)}{r - 1} = 2,431$$

the solution to which is: $r = 1.069$, or an annual increase of 6.9%. This gives the following sequence of intakes:

1976	423
1977	453
1978	484
1979	517
1980	553
Total	2,430

22. These projections postulate that there would continue to be over-aged entry up to 1980, which could well happen. If it is felt that over-aged entry will be cleared before that year, the distribution could project entry equal to population aged 6 for the later years and distribute the remainder of the total among the earlier years.

ZAIRE: PRIMARY EDUCATION: NATIONAL ENROLMENT RATIOS BY AGE AND SEX, 1968 TO 1972

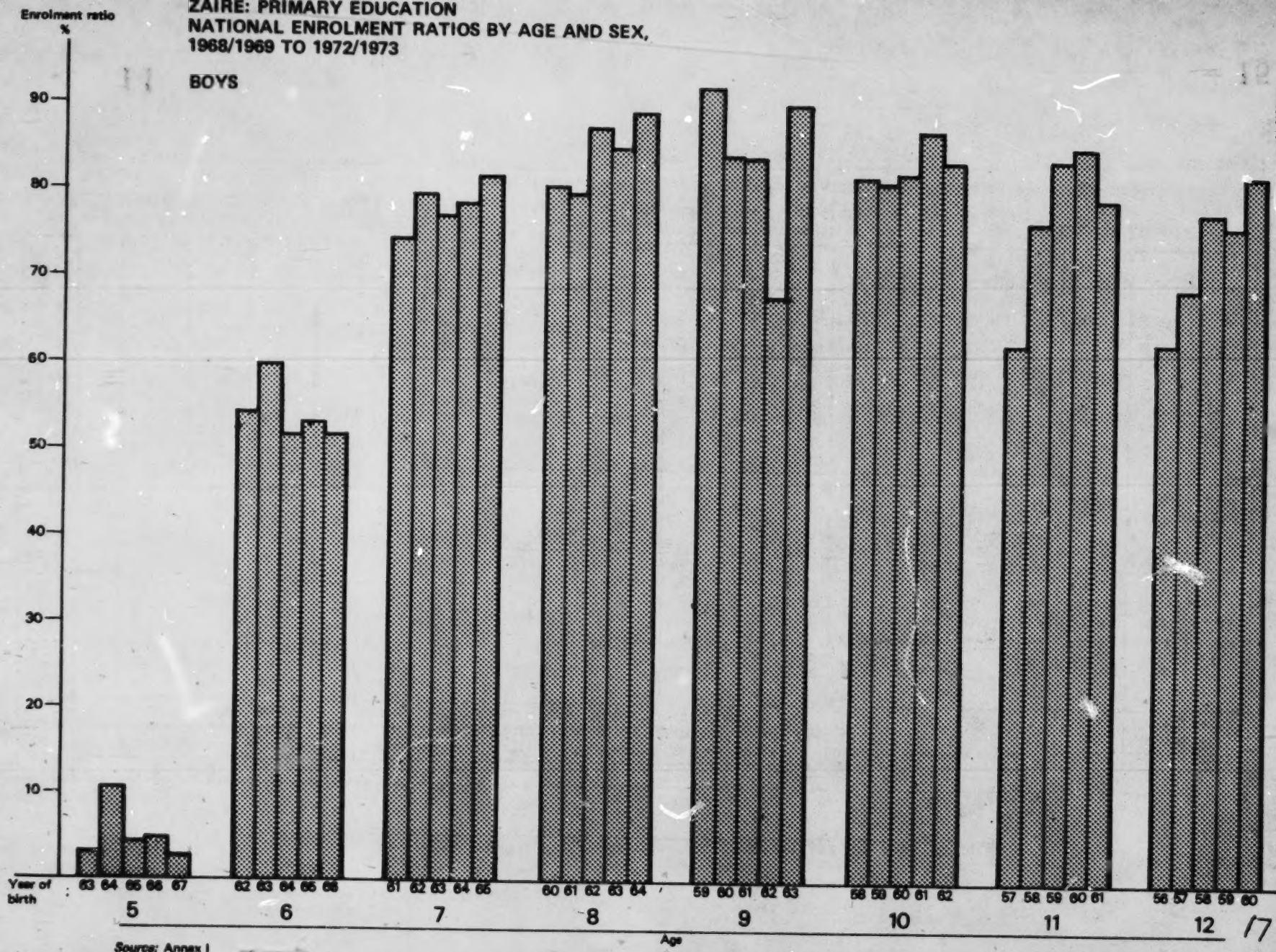
Sex	Year of birth	1968				1969				1970				1971				1972			
		Age	Population (000s)	Enrolments (000s)	Enrolment ratio	Age	Population (000s)	Enrolments (000s)	Enrolment ratio	Age	Population (000s)	Enrolments (000s)	Enrolment ratio	Age	Population (000s)	Enrolments (000s)	Enrolment ratio	Age	Population (000s)	Enrolments (000s)	Enrolment ratio
Boys	1956	12	248	154	0.621	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1957	11	255	158	0.620	12	255	174	0.682	-	-	-	-	-	-	-	-	-	-	-	-
	1958	10	262	212	0.809	11	262	199	0.760	12	262	202	0.771	-	-	-	-	-	-	-	-
	1959	9	270	246	0.911	10	270	217	0.804	11	270	224	0.830	12	269	203	0.755	-	-	-	-
	1960	8	280	224	0.800	9	279	232	0.832	10	278	226	0.813	11	278	235	0.845	12	277	225	0.812
	1961	7	290	214	0.738	8	289	229	0.792	9	288	239	0.830	10	287	247	0.861	11	286	225	0.787
	1962	6	303	163	0.538	7	300	237	0.790	8	298	258	0.866	9	297	199	0.670	10	295	244	0.827
	1963	5	318	10	0.031	6	313	186	0.594	7	310	237	0.765	8	308	260	0.844	9	306	273	0.892
	1964	-	-	-	-	5	328	34	0.104	6	323	166	0.514	7	321	250	0.779	8	318	280	0.881
	1965	-	-	-	-	-	-	-	-	5	339	14	0.041	6	334	176	0.527	7	331	268	0.810
	1966	-	-	-	-	-	-	-	-	-	-	-	-	5	350	16	0.046	6	345	177	0.513
	1967	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	361	9.5	0.026
Girls	1956	12	247	73	0.296	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1957	11	254	88	0.346	12	254	84	0.331	-	-	-	-	-	-	-	-	-	-	-	-
	1958	10	261	120	0.460	11	261	104	0.398	12	260	104	0.400	-	-	-	-	-	-	-	-
	1959	9	269	135	0.502	10	268	127	0.474	11	267	124	0.464	12	266	122	0.459	-	-	-	-
	1960	8	278	152	0.547	9	276	147	0.533	10	275	141	0.513	11	274	137	0.500	12	273	113	0.414
	1961	7	287	158	0.551	8	285	148	0.519	9	283	151	0.534	10	281	141	0.502	11	280	120	0.429
	1962	6	297	101	0.340	7	295	157	0.532	8	292	180	0.616	9	290	161	0.555	10	289	180	0.623
	1963	5	309	7	0.023	6	306	118	0.386	7	303	165	0.545	8	300	174	0.580	9	297	173	0.582
	1964	-	-	-	-	5	318	16	0.050	6	314	108	0.344	7	311	162	0.521	8	308	185	0.601
	1965	-	-	-	-	-	-	-	-	5	327	10	0.031	6	323	118	0.365	7	319	173	0.549
	1966	-	-	-	-	-	-	-	-	-	-	-	-	5	337	10	0.030	6	332	124	0.373
	1967	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	347	14	0.040

Source: Compiled from Annuaires statistiques de l'éducation, 1968/69 to 1972/73, and estimates of populations based on Perspectives démographiques provisoires pour la République du Zaire - Institut national de la statistique.

Note: Enrolments include those in all schools, Government, aided and unaided. The analysis does not include ages over 12, which is one year beyond the official age range of primary schools.

ZAIRE: PRIMARY EDUCATION
NATIONAL ENROLMENT RATIOS BY AGE AND SEX,
1968/1969 TO 1972/1973

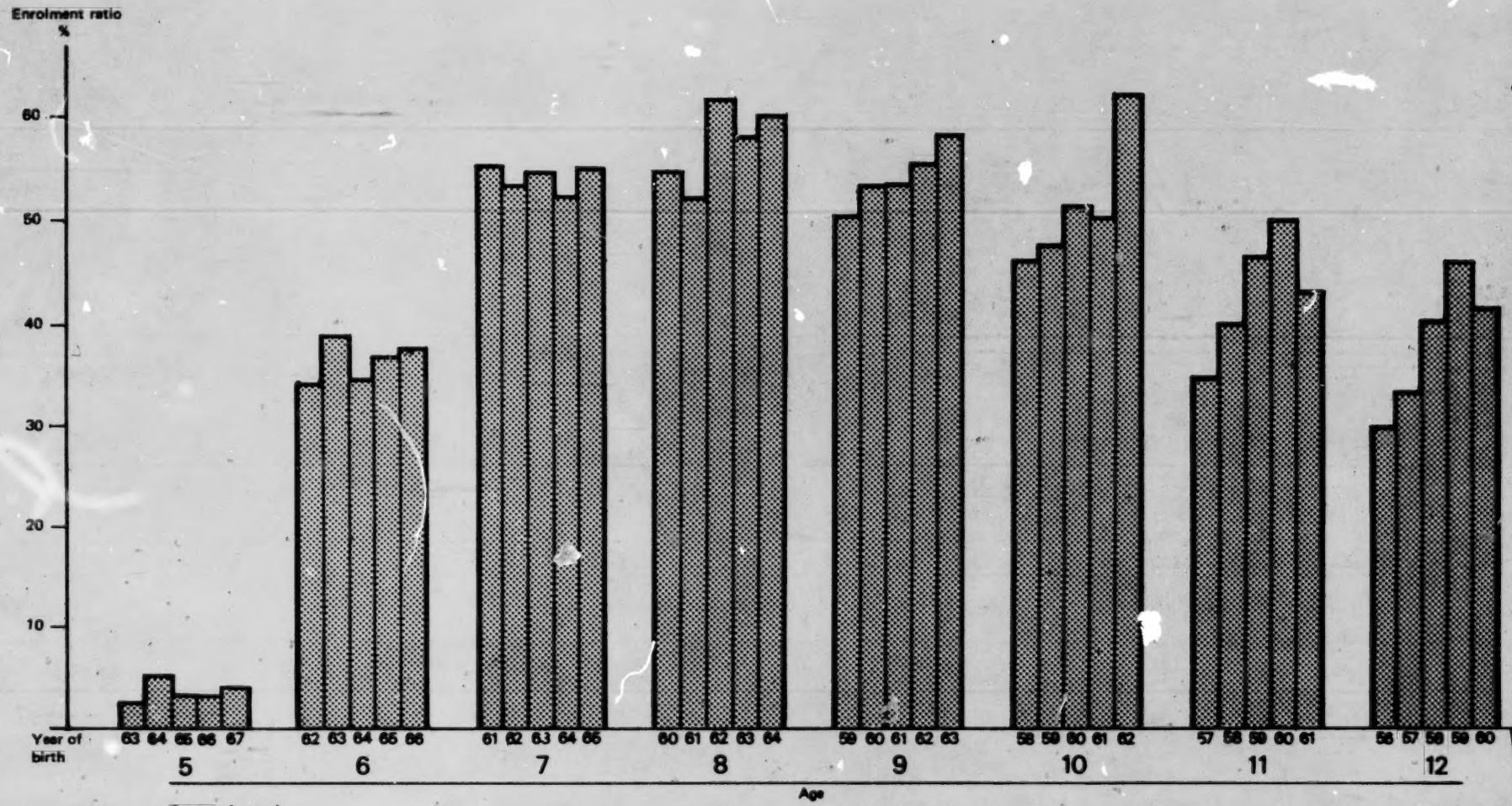
BOYS



Source: Annex I

ZAIRE: PRIMARY EDUCATION
NATIONAL ENROLMENT RATIOS BY AGE AND SEX
1968/1969 TO 1972/1973

GIRLS



Source: Annex I

STUDY TOUR OF VARIOUS EDUCATIONAL INSTITUTIONS IN EUROPE

by

R. Aujame

STUDY TOUR OF VARIOUS EDUCATIONAL INSTITUTIONS IN EUROPE

Introduction

Within the framework of Divisional activities we undertook in June/July 1975 a study tour of certain educational institutions in Denmark, the Federal Republic of Germany, Great Britain and Sweden, which were selected with regard to their specific educational innovative characteristics.

The purpose of the study was to:

(a) Visit, and comment upon, the more recent experiences of combined formal and non-formal education in various European countries;

(b) Determine, in light of these visits, the essential elements which would be needed for an architect's brief, particular attention being paid to facilities, together with furniture and equipment, of an innovative character;

(c) Compare space standards of related types of institutions; and

(d) Define, for each institution, design proposals contributing to a definite improvement toward the comfort of those using the premises.

General Considerations

A wide range of institutions (totalling 18) at primary and secondary level, including one school of education at university level, were visited. These represented all types: from larger urban schools in densely-populated urban areas to comprehensive schools, middle schools and community centres in suburban districts.

On completing the study tour it was evident that the approach to educational innovation varied from one country to another and even from one institution to another. In some instances, the programme was different, in others, the organization of space or type of equipment, etc.

On the other hand, certain features that these institutions do have in common are:

- recent construction; most of them have been in operation only since 1973;
- being considered by the respective official authorities as school prototypes and part of a wider development project;
- all being the result of extensive studies and co-operation between architects and educators from various public services. One particular example - Denmark: the institutions visited

were the result of fruitful collaboration, during the design phase, between a private architect and the future headmaster of each particular institution.

Implementation of the different projects has been successfully carried out, either under direct supervision by local authorities or the sponsorship of competent official bodies at regional or national level.

In order to compare the various institutions visited, with some degree of accuracy, we have limited our choice for the study to certain examples of secondary education (lower cycle) having corresponding facilities. All the findings in the study are presented in table form (see Tables I to VIII). Clearly the most important implication of educational innovation, in terms of building is (a) space: for individual and group activities, shelving of pedagogical aids and work carried out by pupils, not to mention space for exhibition and/or group discussion, etc. and (b) flexibility in the use of space, for quick and easy adaptation to various educational requirements.

The visit to the various institutions has shown that, in fact, the main preoccupation of the architects has been:

- priority given to flexibility in the use and organization of space;
- diversification of volume and space provided;
- research of solutions providing better comfort (natural lighting, ventilation, protection against prevailing climatic conditions, etc.);
- use of modular co-ordination; standardization of gridiron structure, with wider span and less use of columns.

In general, most schools offer a wide variety of school furniture, particularly mobile-type, which adds to the above-mentioned flexibility. There is also a tendency towards standardization of mobile, combined elements, such as cupboards, cabinets, shelving, etc.(see photographs and list in annexes).

Several design elements and architectural features drew our attention as representing a good example of educational innovation. Among these it would seem worthwhile to mention:

- polyvalent use of a large number of educational and communal facilities;
- variety of well designed models of both furniture and educational equipment;
- concept of "design centres" in the United Kingdom (see details in annexes);

- integration in schools, and the importance of community centres in the Federal Republic of Germany;
- concept of general staff quarters in Denmark;
- concept of open-space in Danish and Swedish schools;
- extensive use of 'sky-domes', which provide good, natural, lighting whilst, at the same time, allow more wall-space;
- use of patios that provide interesting and well-protected outdoor space;
- importance given to colour and sign-boards for signalization, also provision of easily identifiable landmarks within the school.

A detailed description of these elements is given in the following report.

TABLE I

STUDY TOUR : JUNE-JULY, 1975

LIST OF INSTITUTIONS VISITED

Country	City or Town	No.	Name of Institution	Year of Operation	Type of School	Age Group	Enrolment Formal	Enrolment Non-Formal	Remarks
FEDERAL REPUBLIC OF GERMANY	Hamburg	1	Steilshoop Comprehensive School and Community Centre	Completed end 1973	Gesamtschule (comprehensive integrated multi-option community school)	Grade: 5-7 8-10 11-13	Capacity: 2400 Actual: 1200	2500	Communal activities include: youth club; kindergarten; Ed. counselling; day-care centre; public library; youth activities, adult education, etc.
		2	Mümmelmannsberg Comprehensive and Community Centre	1st phase completed August, 1974	As above	As above	Capacity: 2400 Actual: 800	2500	Same architect as Steilshoop compact plan.
	West Berlin	3	Steglitz Middle School	January, 1975	"Mittelstufenzentren" (Middle School Centre)	Grade: 7-10	1200	1200	Design chosen through municipal competition
DENMARK	Farum	4	Stavnsholtskolen Comprehensive School	1973	Comprensive Co-ed.	Grade: 1-6 7-10	900	-	Open-plan; rebuilt after fire destruction
	Greve	5	Krogard Primary School	1967	Primary/ Co-ed.	Grade: Nursery + 1-3	225	-	Open-plan
		6	Tjørnely Comprehensive School	1972	Comprehensive Co-ed.	Grade: 1-10	900	-	Open-plan

LIST OF INSTITUTIONS VISITED (Continued)

Country	City or Town	No.	Name of Institution	Year of Operation	Type of School	Age Group	Enrolment Formal	Enrolment Non-Formal	Remarks
UNITED KINGDOM	Coventry	7	Sidney Stringer School & Community College	1972	Comprehensive Co-ed.	Age: 11-18	1800	250	Scattered 2-storey buildings
	Groby	8	Groby High School	Jan.1975	Middle School Co-ed.	Age 11,12,13	720	-	Home year base blocks and open-plan design centre
	Earl Shilton	9	Heathfield High School & Community College	1938 Additions: 1956-1959 and 1971	Comprehensive Co-ed.	Grade: 1 - 12	800	200	Begun in 1971 as a community college
	Loughborough	10	Rawlins Upper School & Community College, Quorn	1897 Additions: 1967 & 1972	Upper Secondary Co-ed.	Age: 14-18	1200	1000	Open-plan design centre; built 1972. Matched population system since 1975
		11	Hindley College, Shepshed	1957 Additions: 1973	Comprehensive Co-ed.	Age: 10-14	650	1200	
	Coalville	12	Warren Hills, Primary School	1970	Primary	Nursery+ Grade 1-6	290	-	Open-plan
	Groby	13	Elisabeth Woodville, Primary School	1973	Primary	Nursery+ Grade 1-6	320	-	Open-plan
SWEDEN	Malmö	14	Kroksbäckskolen (comprehensive)	1971	Comprehensive Co-ed.	Junior Middle Senior	Capacity: 900 Actual: 870	-	Open-plan
		15	School of Education	1969	Teacher Training College	University Level			
		16	Örtagärdsskolen	1971	Primary & Middle Co-ed.	Grade: 1-6	420	-	70 mentally and/or physically retarded pupils
	Helsingborg	17	Ronovskaskolen	1948 Rehabil. 1975	Technical School Co-ed.	Age: 14-16			Premises obtained from Army; 3-storey builds.; rehab.1975
		18	St.Nicolas School	1865 Additions: 1898 & 1954	Upper Secondary	Grade: 10,11,12	900		

TABLE II : PRINCIPLES OF EDUCATIONAL AND ARCHITECTURAL INNOVATION

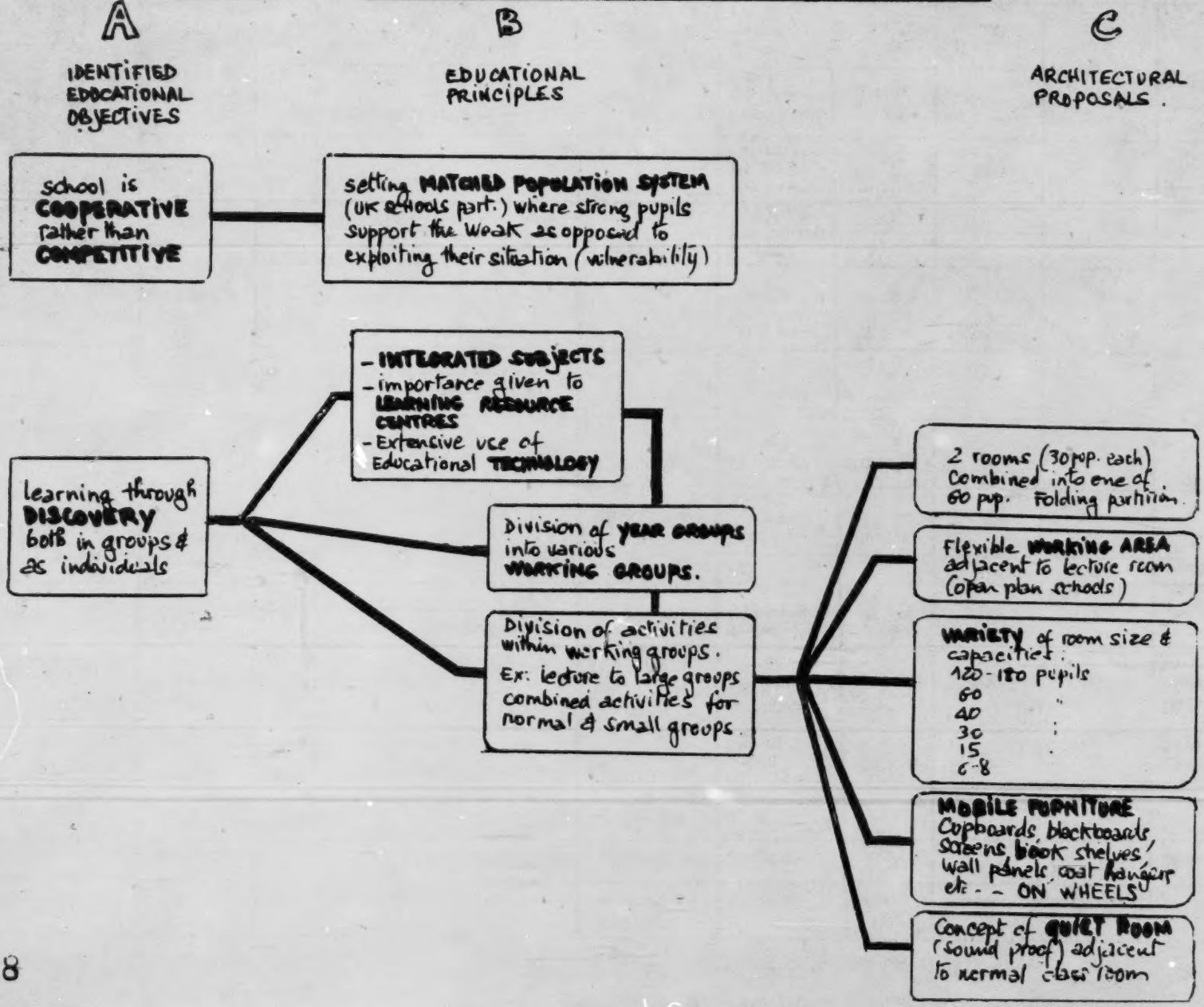

A
IDENTIFIED EDUCATIONAL OBJECTIVES
B
EDUCATIONAL PRINCIPLES
C
ARCHITECTURAL PROPOSALS.
school is COOPERATIVE rather than COMPETITIVE
setting MATCHED POPULATION SYSTEM (UK schools part.) where strong pupils support the weak as opposed to exploiting their situation (vulnerability)
learning through DISCOVERY both in groups & as individuals
- INTEGRATED SUBJECTS
- importance given to LEARNING RESOURCE CENTRES
- Extensive use of Educational TECHNOLOGY
Division of YEAR GROUPS into various WORKING GROUPS.
Division of activities within working groups.
Ex: lecture to large groups combined activities for normal & small groups.
2 rooms (30 pop. each) Combined into one of 60 pup. Folding partition.
Flexible WORKING AREA adjacent to lecture room (open plan schools)
VARIETY of room size & capacities:
120 - 180 pupils
60 "
40 "
30 "
15 "
6-8 "
MOBILE FURNITURE
Cupboards, blackboards, screens, book shelves, wall panels, coat hangers etc. - ON WHEELS
Concept of QUIET ROOM (sound proof) adjacent to normal classroom

TABLE II : PRINCIPLES OF EDUCATIONAL AND ARCHITECTURAL INNOVATION/(CONTINUED)

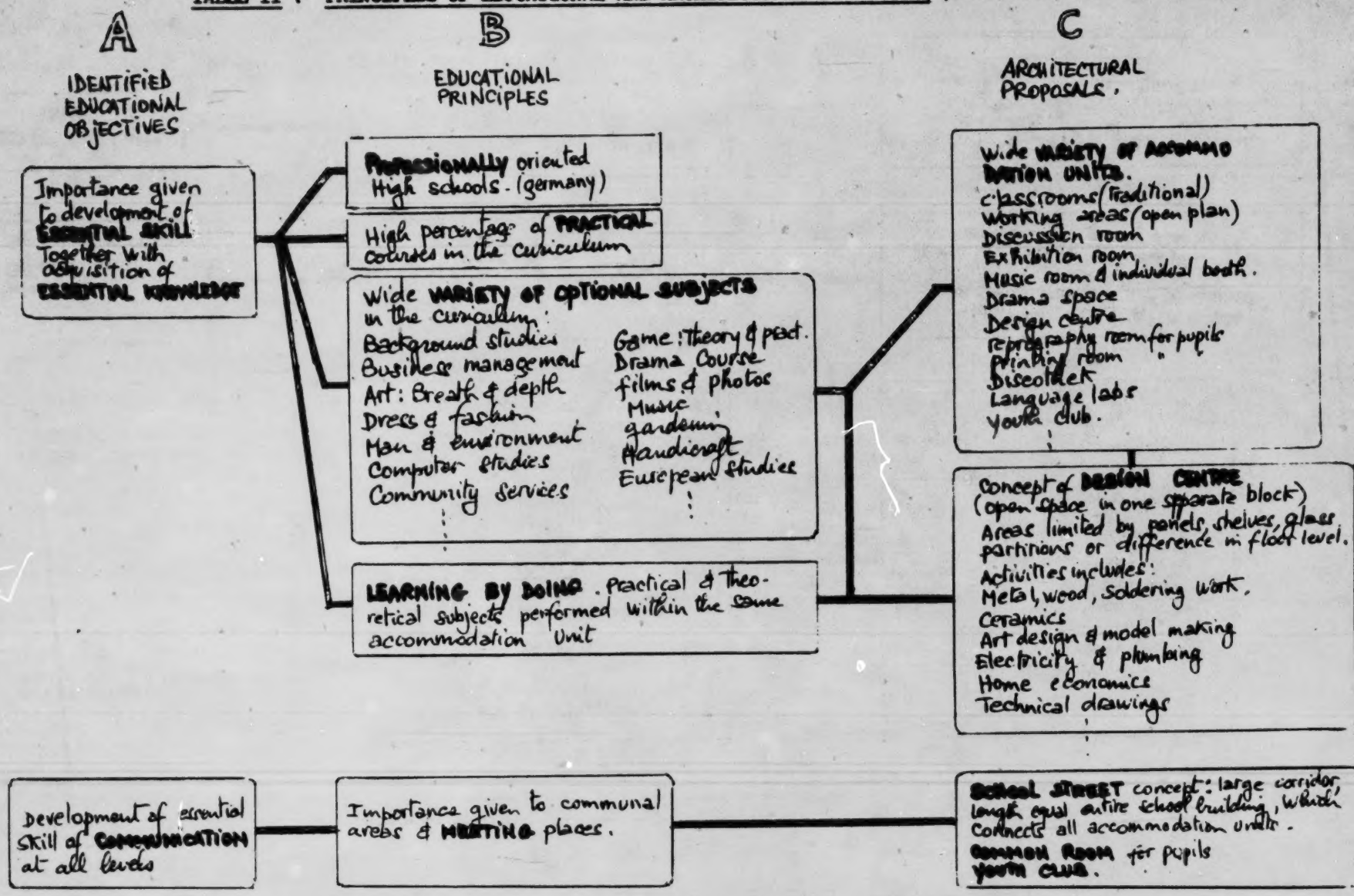


TABLE II : PRINCIPLES OF EDUCATIONAL AND ARCHITECTURAL INNOVATION/(CONTINUED)

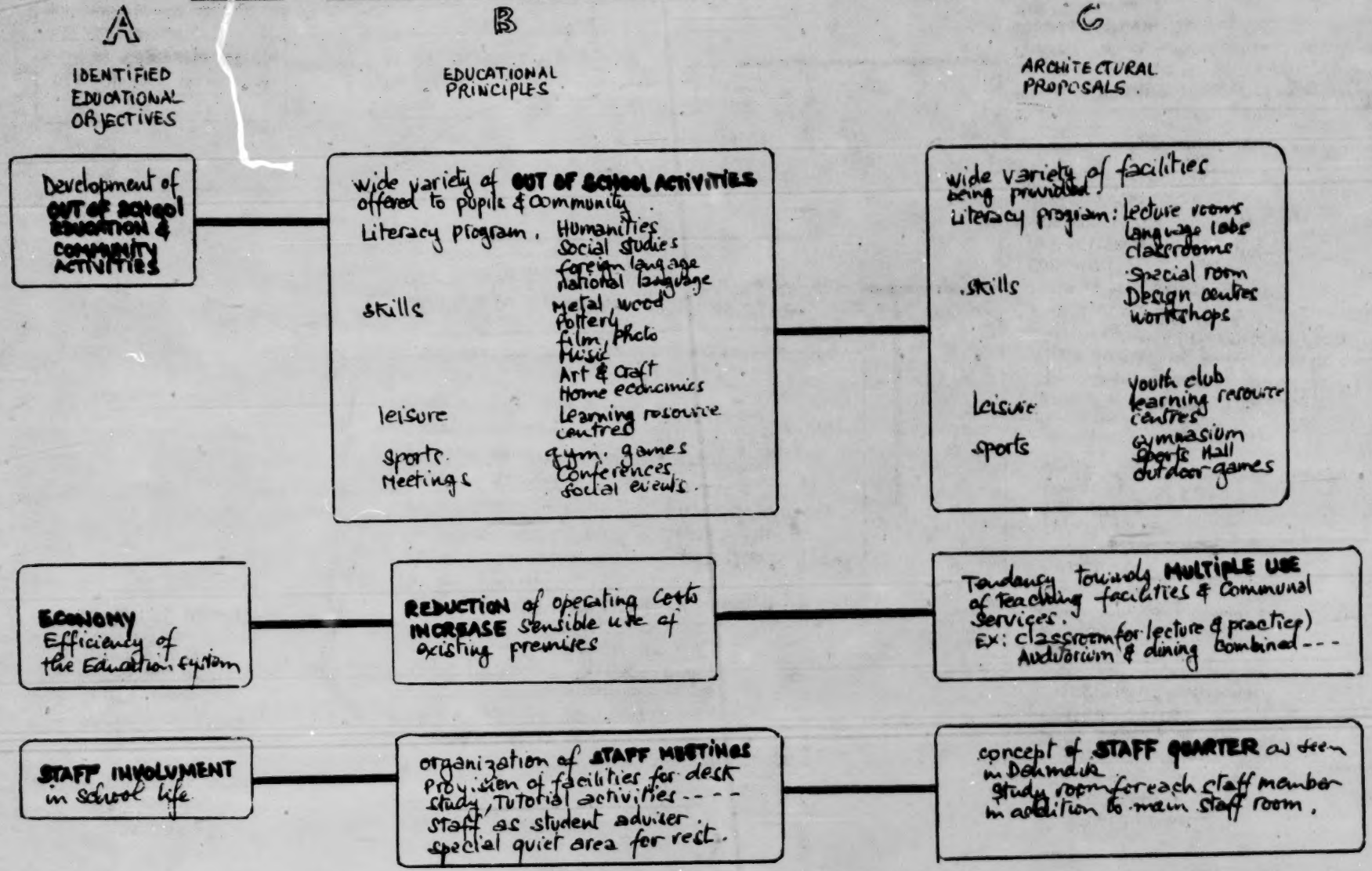


TABLE III

SCHEDULE OF ACCOMMODATION : 1st PHASE

1. MUMMELMANNSBERG,
HAMBURG,
FEDERAL REPUBLIC OF GERMANY.

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
Out-of-School Activities: (students + community)			
Multi-purpose hall	1	782.00	782.00
Entrance and cloakroom	2	90.20	180.40
Activities room : Type A	9	70.68	636.00
" " " : Type B	10	46.31	463.00
Offices	2	22.70	45.40
Parents' sitting room)	1	70.68)	
Tutorial room)	1+1	11.40)	: 82.20
Youth Club			
Activities room: A	1	28.50)	
B	1+1	58.50)	: 87.00
Seminar rooms	6	20.40	122.40
Cafeteria	1	264.00	264.00
Services	1	58.50	58.50
			Sub-total : 2,720.90
Public Library and Services:			
Main entrance	1	16.60	16.60
Lecture room	1	442.40	442.40
Audio-visual area	1	87.00	87.00
Seminar room	1	52.20	52.20
Information and general purposes	1	173.20	173.20
Offices	5+1	199.60	199.60
Stockroom	1	177.60	177.60
Workshop	1	176.00	176.00
Toilets and Services	-	46.00	46.00
			Sub-total : 1,370.60

SCHEDULE OF ACCOMMODATION : 1st PHASE

1. MUMMELMANNSBERG,
HAMBURG,
FEDERAL REPUBLIC OF GERMANY
(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
General Education			
Classroom:			
Type A (common room)	2	102.00	204.00
" B (of which 3 are language laboratories)	7	70.68	495.00
" C	15	45.30	679.50
" D	12	34.43	413.00
" E	2	29.68	59.40
" F	4	25.37	101.50
Tutorial room	1	11.25	11.25
Additional room:			
Type C	6	45.30	271.80
Type D	4	34.43	137.70
Auditorium	2	134.00	268.00
			Sub-total : 2,641.15
Science Block : 1st Floor			
Laboratories	8	76.12	609.00
Collection room	1	76.10	76.10
Lecture room	1	100.00	100.00
Preparation room	1	47.25	47.25
" " "	1	43.75	43.75
Additional space	1	150.00	150.00
Office	1	41.00	41.00
"	1	20.50	20.50
Science Block : 2nd Floor			
Laboratories	10	76.12	761.20
Collection area	1	167.40	167.40
Preparation area (1 + 1)	2	170.35	340.70
Additional space not yet allocated	-	220.37	220.40
			Sub-total : 2,577.30

SCHEDULE OF ACCOMMODATION : 1st PHASE

1. MUMMELMANNSBERG,
HAMBURG,
FEDERAL REPUBLIC OF GERMANY
(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
Workshops : 1st Floor			
Workshops 1, 2 and 3	3	80.43	241.30
" " 4 and 5	2	57.00	114.00
" " 6	1	84.00	84.00
" " 7	1	57.75	57.75
Storage space and preparation area	-	120.00 / 34.00	120.00 / 34.00
Workshops : 2nd Floor			
Workshop 1	1	185.25	185.25
" " 2	1	117.00	117.00
" " 3 and 4	2	95.00	190.00
" " 5	1	56.00	56.00
" " 6	1	68.25	68.25
Storage space	-	102.40	102.40
			Sub-total : 1,369.95
Sports Hall	1	728.00	728.00
Cloakroom, showers, toilets :			
Men :	1	156.75	156.75
Women :	1	175.75	175.75
Loggia	1	73.50	73.50
Storage space	-	161.00	161.00
			Sub-total : 1,295.00

SCHEDULE OF ACCOMMODATION : 1st PHASE

1. **MUMMELMANNSBERG, HAMBURG, FEDERAL REPUBLIC OF GERMANY (Continued).....**

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.	
Administration:				
Doorkeeper/Information Lodge	1	26.25	26.25	
Offices	13	313.00 (total)	313.00	
Meeting room : No.1	1	29.75	29.75	
" " : No.2.	1	142.40	142.40	
Architect's office	1	172.50	172.50	
Appartment : 1	1	100.00)	200.00	
" " : 2	1	100.00)		
			Sub-total :	883.90
Sanitary Space:				
Ground floor : Total:			255.00	
Second floor : Total:			200.00	
Third floor : Total:			55.00	
			Sub-total :	510.00
Circulation :			3,745.00	
			Sub-total :	3,745.00
			GRAND TOTAL :	17,113.80

SCHEDULE OF ACCOMMODATION : 1st PHASE

2. STEGLITZ MIDDLE SCHOOL,
WEST BERLIN,
FEDERAL REPUBLIC OF GERMANY

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.	
EDUCATIONAL				
General Subjects:				
Classroom : 40 pupils	2	92.20	184.40	
" " : 30 pupils	3	60.50	181.50	
Teachers' room	1	46.10	46.10	
Teachers' meeting room	1	36.00	36.00	
			Sub-total :	448.00
Social Sciences:				
Classroom : 40 pupils	2	92.20	184.40	
" " : 30 pupils	3	60.50	181.50	
Teachers' room	1	46.10	46.10	
Teachers' meeting room	1	60.50	60.50	
			Sub-total :	472.50
Languages:				
Lecture room : 40 pupils	2	92.20	184.40	
" " : 30 pupils	4	60.50	242.00	
Language laboratory : 30 pupils	2	83.50	167.00	
" " : 20 pupils	1	60.50	60.50	
Storage (for tapes)	1	21.60	21.60	
Teachers' room	1	60.50	60.50	
Teachers' meeting room	1	31.70	31.70	
			Sub-total :	767.70
Mathematics:				
Lecture room : 40 pupils	2	92.20	184.40	
" " : 30 pupils	3	60.50	181.50	
Teachers' room	1	60.50	60.50	
Teachers' meeting room	1	36.00	36.00	
			Sub-total :	462.40

2. STEGLITZ MIDDLE SCHOOL
WEST BERLIN
FEDERAL REPUBLIC OF GERMANY
(Continued) .....

	No. of Units	Net area per unit in Sq. m.	Total net area in Sq. m.
EDUCATIONAL/Continued			
Mediatek : (public and school members)			
Lecture rooms	1+1	319.70	319.70
Loan counter	1	51.80	51.80
Individual reading area (150 places)	1	305.40	305.40
Administrative area (Librarian's office, etc.)	-	223.40	223.40
Technical services (reproduction repairs etc.)	-	151.20	151.20
		Sub-total :	1,051.50
Natural Sciences :			
Lecture-Demonstration room	3	47.50	142.50
	1	77.80	77.80
Preparation/storage	3	31.70	95.10
	1	11.50	11.50
Collection room	3	51.80	155.40
Science laboratory : (practical activities) :			
30 pupils :	5	92.02	461.00
20 pupils :	2	47.50	95.00
Teachers' room and meeting room	2	57.60	115.20
		Sub-total :	1,153.50
Workshops			
Industrial :			
Machine shop	1	83.00	83.00
Wood and metal	1	172.80	172.80
Tool storage	1	51.80	51.80
Material storage	1	83.50	83.50
Topography and Measurement	1	47.50	47.50
Electro-technic	1	47.50	47.50

2. STEGLITZ MIDDLE SCHOOL,
WEST BERLIN,
FEDERAL REPUBLIC OF GERMANY
(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
Workshops/Continued			
Accountancy:			
Shorthand-typing	1	77.80	77.80
Book-keeping	1	77.80	77.80
Printing equipment	1	64.80	64.80
Photographic equipment	1	46.10	46.10
Home economics			
Cookery	1	97.90	97.90
Storage space	1	11.50	11.50
Home science	1	43.20	43.20
Sewing/Textile weaving	1	92.20	92.20
Storage space	1	21.60	21.60
Teachers' office	1	69.10	69.10
Teachers' meeting room	1	36.00	36.00
Drawing and Design Centre :	3	83.50	250.50
" " " " :	2	103.70	207.40
			Sub-total : 1,582.00
Music			
Music room	1	83.50	83.50
Studio	1	60.50	60.50
Studio	1	60.50	60.50
Booths	3	5.70	17.30
	1	17.30	17.30
	1	21.60	21.60
Teachers' office and workroom	1	30.30	30.30
	1	31.70	31.70
	1	21.60	21.60
			Sub-total : 344.30

SCHEDULE OF ACCOMMODATION : 1st PHASE

2. STEGLITZ MIDDLE SCHOOL,
WEST BERLIN,
FEDERAL REPUBLIC OF GERMANY
(Continued).....

	No. of Units	Net Area per unit in Sq.m.	Total net area in Sq.m.	
Art				
Art room	2	83.50	167.00	
Art shop	1	51.80	51.80	
Storage space	-	31.70	31.70	
			Sub-total :	250.50
Leisure area:				
Leisure room/common room (including cloakroom):				
Grade 9-10	4	184.30	737.20	
Grade 7- 8	4	302.50	1,209.60	
Cloakrooms	4	31.70	127.10	
Discothèque, services and dance hall	1	76.30	76.30	
			Sub-total :	2,150.20
Dining and Food Preparation Area				
Cafeteria and services	1	169.90	169.90	
Dining room (main)	1	554.40	554.40	
Cloakroom	1	63.40	63.40	
Dining area services	1	187.20	187.20	
			Sub-total :	974.90
Out-of-School Activities				
Club Area	2	31.70	63.40	
Youth Club	1	21.60	21.60	
Seminar Room	1	60.50	60.50	
			Sub-total :	145.50
Administration				
Various rooms	10	280.80	280.80	
Director's flat	1	83.50	83.50	
			Sub-total :	364.30
Sports Hall & Services				
Hall : boys	1	933.10	933.10	
Hall : girls	1	619.00	619.00	
Services : boys	1	406.10	406.10	
: girls	1	276.40	276.40	
			Sub-total :	2,234.60
Toilets	-	384.50	384.50	
Circulation	-	3,345.00	3,345.00	
			GRAND TOTAL :	**16,131.40**

3. **STAVNSHOLTSKOLEN,**
FARUM,
DENMARK

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
DEPARTMENT I. (8, 9 and 10th Grade)			
Classroom : Type A	4	51.84	207.36
" " : Type B	3	46.08	138.24
" " : Type C	1	34.56	34.56
" " : Type D	4	23.04	92.16
Library	1	115.20	115.20
Multi-purpose activities area:	2	126.72	253.44
	1	86.40	86.40
Common room	1	149.76	149.76
Staff room	1	51.84	51.84
Outdoor area	1	69.12	69.12
Kitchen	1	11.52	11.52
Storage area	-	40.32	40.32
Toilets	-	34.56	34.56
Circulation	-	144.00	144.00
			Sub-total : 1,428.48
DEPARTMENT II. (5, 6 and 7th Grade)			
Information room (general purpose)	1	149.76	149.76
Classroom : Type B	4	46.08	184.32
" " : Type E	8	23.04	184.32
Hall (multi-purpose activities)	4	126.72	506.88
Special class area	1	23.04	23.04
Practical activities	1	253.44	253.44
Kitchen area	1	11.52	11.52
Staff room	1	23.04	23.04
Outdoor area	1	69.12	69.12
Storage area	-	69.12	69.12
Toilets	-	34.56	34.56
Circulation	-	103.68	103.68
			Sub-total : 1,612.80

3. STAVNSHOLTSKOLEN,
FARUM,
DENMARK
(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
DEPARTMENT III. : Primary School			
Information area (large classroom)	1	149.76	149.76
Classroom : Type B	2	46.08	92.16
" " : Type E	4	23.04	92.16
Hall (multi-purpose area)	2	126.72	253.44
Home base activities	3	69.12	207.36
Special class area	1	23.04	23.04
Library	1	103.68	103.68
Practical activities area	1	138.24	138.24
Physical education room	1	149.76	149.76
Kitchen	1	11.52	11.52
Staff room	1	23.04	23.04
Outdoor area	1	69.12	69.12
Storage area	-	51.84	51.84
Toilets	-	34.56	34.56
Circulation	-	92.16	92.16
			Sub-total : 1,491.84
Communal Activities			
Dining area	1	288.00	288.00
Kitchen	1	23.04	23.04
Mediatek	1	299.52	299.52
Seminar room (discussion area)	1	46.08	46.08
Reading area	1	103.68	103.68
Photo. laboratory	1	11.52	11.52
Audio-visual laboratory	1	23.04	23.04
Librarian's room	1	23.04	23.04
Information room	1	69.12	69.12
Storage area	-	46.08	46.08
			Sub-total : 933.12

3. STAVNSHOLTSKOLEN,
FARUM,
DENMARK
(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.	
Practical Activities				
Science laboratory (lecture/demonstration + practice)	1	69.12	69.12	
(including collection room)	1	138.24	138.24	
Workshops:				
metalwork	1	86.40	86.40	
woodwork	1	69.12	69.12	
masonry	1	34.56	34.56	
technology	1	34.56	34.56	
ceramics	1	115.20	115.20	
workbench area	1	46.08	46.08	
art room	1	138.24	138.24	
home economics	1	190.08	190.08	
storage space	-	161.28	161.28	
circulation	-	11.52	11.52	
			Sub-total :	1,094.40
Specialized rooms				
Music room	1	92.16	92.16	
Typing room	1	69.12	69.12	
Language laboratory	1	103.68	103.68	
Drama room	1	138.24	138.24	
Hall	1	23.04	23.04	
Storage area	-	46.08	46.08	
Circulation	-	34.56	34.56	
			Sub-total :	506.88

3. STAVNSHOLTSKOLEN,
FARUM,
DENMARK
(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.	
Staff Quarters				
Conference room	1	34.56	34.56	
Director's office	1	34.56	34.56	
Psychologist's office	1	23.40	23.40	
Inspector's office	1	51.84	51.84	
Deputy Inspector's office	1	23.40	23.40	
Staff room	1	51.84	51.84	
Waiting room	1	17.28	17.28	
Staff working area	1	34.56	34.56	
" " "	1	23.40	23.40	
Working area	1	69.12	69.12	
Tutorial room	1	34.56	34.56	
Storage space	-	11.52	11.52	
Cloakroom-Toilets	-	63.36	63.36	
Circulation	-	23.40	23.40	
			Sub-total :	496.80
Administration				
Offices, storage space, waiting room, cloakroom, etc.	-	449.28	Sub-total :	449.28
Out-of-school kindergarten	-	138.24	Sub-total :	138.24
School "street"	-	633.60	Sub-total :	633.60
			GRAND TOTAL : (Indoor area)	8,785.44

School Capacity : 900 pupils:
area per pupil place:

9.76 sq.m.

SCHEDULE OF ACCOMMODATION : 1st PHASE

4. GROBY HIGH SCHOOL, LEICESTERSHIRE, U.K.

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.	
Entrance Hall and Administration				
Entrance Hall	1	66.00	66.00	
Secretariat	1	35.00	35.00	
Medical room and Doctor's office	1	23.00	23.00	
Staff common room : No.1	1	64.00	64.00	
" " " : No.2	1	45.00	45.00	
			Sub-total :	233.00
Design Centre				
Workshops:				
Arts and crafts	1	140.00	140.00	
Ceramics	1	50.00	50.00	
Dressmaking and needlework	1	65.00	65.00	
Home-crafts	1	65.00	65.00	
Wood and metalwork	1	115.00	115.00	
General practice	1	65.00	65.00	
Office	1	25.00	25.00	
Storage space	-	30.00	30.00	
			Sub-total :	555.00
11-Year Base : Humanities				
Classroom : No. 1) " " : No. 2) :	1	85.00	85.00	
" " : No. 3	1	62.00	62.00	
"Quiet" Room: No. 4	1	13.00	13.00	
Classroom : No. 5) " " : No. 6) : " " : No. 7)	1	85.00	85.00	
Common space	-	50.00	50.00	
Storage space	-	8.00	8.00	
			Sub-total :	303.00

4. GROBY HIGH SCHOOL,
LEICESTERSHIRE, U.K. (Continued)....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.	
12 Year Base : Mathematics and Science				
Classroom : No. 8) " " : No. 9) :	1	85.00	85.00	
" " : No.10	1	62.00	62.00	
"Quiet" Room Nc.11	1	13.00	13.00	
Classroom : No.12	1	62.00	62.00	
" " : No.13) " " : No.14) :	1	85.00	85.00	
Common space	-	50.00	50.00	
Storage space	-	8.00	8.00	
			Sub-total :	365.00
13-Year Base : Languages and Science				
Classroom : No.15	1	38.00	38.00	
" " : No.16	1	40.00	40.00	
" " : No.17	1	40.00	40.00	
" " : No.18	1	40.00	40.00	
Science lab: No.19	1	73.00	73.00	
" " : No.20) " " : No.21) including prep.room	1	125.00	125.00	
			Sub-total :	356.00
Sports Hall and Annexes				
Gymnasium	1	185.00	185.00	
Storage space	-	8.00	8.00	
Changing room : boys and girls	1	55.00	55.00	
Music room	1	58.00	58.00	
Music booths	1	15.00	15.00	
			Sub-total :	321.00

SCHEDULE OF ACCOMMODATION : 1st PHASE

4. GROBY HIGH SCHOOL, LEICESTERSHIRE, U.K.

(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.	
Assembly Hall and Services				
Assembly Hall	1	185.00	185.00	
Lecture Theatre	1	70,00	70.00	
Storage space	1	18.00	18.00	
Drama studio	1	110.00	110.00	
Storage space	-	35.00	35.00	
Kitchen and services	1	144.00	144.00	
			Sub-total :	562.00
Library (including storage space)	1	165.00	Sub-total :	165.00
Cloakrooms/Toilets	-	153.00	Sub-total :	153.00
Circulation (including locker space)	-	265.00	265.00	265.00
			GRAND TOTAL :	3,278.00

SCHEDULE OF ACCOMMODATION : 1st PHASE

5. KROKSBACKSKOLEN,
MALMÖ,
SWEDEN.

		No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.	
BLOCK 1:					
Sports Hall, Dining Hall and Leisure Centre					
Sports Activities:					
Entrance Hall		1	26.00	26.00	
Cloakroom Shower room Changing room Toilets	Boys	1	98.40	98.40	
Cloakroom Shower room Changing room Toilets	Girls	1	98.40	98.40	
Gymnasium		1	235.00	235.00	
Storage space		-	28.80	28.80	
Physical education room		1	105.70	105.70	
Storage space		-	9.60	9.60	
Storage space		-	49.00	49.00	
Circulation		-	28.50	28.50	
				Sub-total :	679.40
Dining Area					
Entrance Hall		1	44.50	44.50	
Cloakroom		1	57.00	57.00	
Dining Hall : No.1. (148 seats)		1	104.30	104.30	
Dining Hall : No.2. (151 seats)		1	140.00	140.00	
Service counter and circulation		1	40.00	40.00	
Kitchen		1	48.00	48.00	
Storage space		-	9.50	9.50	
Staff Dining Room		1	22.80	22.80	
Toilets : Staff		1	4.00	4.00	
Toilets : Students		1	28.00	28.00	
Cloakroom : Staff		1	15.10	15.10	
Circulation		-	53.20	53.20	
				Sub-total :	566.40

5. KROKSBACKSKOLEN,
MALMÖ,
SWEDEN
(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
BLOCK 1. (Continued).....			
Leisure Centre			
Entrance and Exhibition area	1	62.80	62.80
Staff common room	1	20.30	20.30
Bar and Services	1	13.80	13.80
Café : Room A	1	71.20	71.20
" : Room B	1	50.70	50.70
Rest Room	1	41.00	41.00
Storage space	-	6.70	6.70
Toilets	-	3.30	3.30
Large Group Activity Room:			
No. 1 :	1	33.60	33.60
No. 2 :	1	24.00	24.00
No. 3 :	1	24.00	24.00
No. 4 :	1	22.80	22.80
No. 4A :	1	22.80	22.80
No. 5 :	1	27.80	27.80
No. 6 :	1	22.80	22.80
Small Group Activity Rooms:	6	10.00	60.00
Storage room and pantry	1	19.00	19.00
Staff offices (tutorial activities)	4	5.00	20.00
Rhythmic Room	1	66.50	66.50
Storage space	-	11.00	11.00
Cloakroom	1	14.50	14.50
Showers and toilets	1	28.10	28.10
Circulation	-	59.20	59.20
		Sub-total :	725.90

5. KROKSBACKSKOLEN,
MALMÖ,
SWEDEN
(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
BLOCK 2:			
High School Centre:			
Entrance Hall	1	74.00	74.00
Cloakroom (including circulation)	1	250.00	250.00
Toilet block : boys	1	42.00	42.00
Toilet block : girls	1	30.40	30.40
Staff cloakroom	1	23.00	23.00
Social area	1	95.40	95.40
Tutorial room	1	14.50	14.50
Workshops:			
woodwork) metalwork) ceramics) :	1	225.00	225.00
Staff room) Toilet and storage space)	1	13.80	13.80
Arts and Crafts	1	86.40	86.40
Film workshop	1	81.60	81.60
Homecraft-environmental study	1	86.40	86.40
Needlework	1	102.00	102.00
Storage space	-	17.80	17.80
Room	1	22.80	22.80
Room	1	38.20	38.20
Drama room	1	91.30	91.30
Language laboratory	2	50.10	100.20
Language practice room	1	70.50	70.50
Language laboratory	2	50.10	100.20
" "	1	40.30	40.30
Technology room	1	70.00	70.00
General subjects room :			
20 students	2	28.50	57.00
60 students	1	70.50	70.50
Teaching staff area	1	32.80	32.80

5. KROKSBACKSKOLEN,
MALMO,
SWEDEN
(Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
BLOCK 2. (Continued).....			
High School Centre/Continued...			
'Laromedel' and Bar	1+1	72.60	72.60
Typing room and duplication	1	94.00	94.00
Staff study room	1	51.60	51.60
Staff common room	1	51.60	51.60
Clinic	1	50.40	50.40
Home economics/cookery (including storage)	1	133.80	133.80
Science laboratory	3	98.60	235.80
Collection-preparation room (open-space plan)	1	93.00	93.00
+ extra preparation room	1	12.20	12.20
Seminar room : 12 students	1	15.70	15.70
" " : 8 students	2	12.20	24.40
General open-plan area (including library)	1	652.50	652.50
Auditorium	1	184.60	184.60
Music room	1	106.00	106.00
Staircase and Circulation area	-	520.00	520.00
Toilets	-	86.20	86.20
			Sub-total : 4,220.50
BLOCK 3:			
Lower and Middle School Centre			
Entrance Hall	4	33.00	132.00
Cloakroom	1	37.50	37.50
" "	1	55.10	55.10
General activity room	1	243.10	243.10
Study room (each room could be divided into two)	2	137.70	275.40
Clinic (with annexes)	1	51.70	51.70

5. KROKSBACKSKOLAN, MALMÖ, SWEDEN (Continued).....

	No. of Units	Net area per unit in Sq.m.	Total net area in Sq.m.
BLOCK 3. (Continued).....			
Lower and Middle School Centre/ Continued			
Duplicating room ('Laromedelsbar')	1	16.80	16.80
General activity room (each room could be divided into two)	2	120.70	241.40
Workshops:			
No. 1 : (Technical)	1	171.00	171.00
No. 2 : (Textile)	1	88.30	88.30
No. 3 : (Metalwork)	1	71.70	71.70
Machine shop	1	24.00	24.00
Model-making room	1	50.75	50.75
Storage space	-	9.50	9.50
Dark Room (including storage)	1	33.30	33.30
Auditorium	1	108.40	108.40
Staff quarters (2 rooms)	1	57.60	57.60
Toilets	-	69.80	69.80
Circulation	-	151.00	151.00
			Sub-total : 1,933.55
BLOCK 4:			
Administration			
PLANS NON-AVAILABLE			(Approx. Total Net area in Sq.m.). 380.00

SUMMARY OF NET AREA (in Sq.m.)

		Sq.m.
BLOCK 1:	Sports Hall Dining Hall Leisure Centre :	1,971.70
BLOCK 2:	High School Centre :	4,220.50
BLOCK 3:	Lower and Middle School Centre :	1,933.30
BLOCK 4:	Administration :	380.00
	GRAND TOTAL :	8,505.75

Area per student place : 9.4 Sq.m.

TABLE IV

COMPARATIVE ANALYSIS : DISTRIBUTION OF AREAS :

INDICATED BY PERCENTAGE OF THE TOTAL NET AREA

TYPE OF ACCOMMODATION	Mümmelmannsberg : (comprehensive & community centre Fed.Rep. of Germany	Steglitz Middle School West Berlin Fed.Rep. of Germany	Stavnsholtskolen (comprehensive) Farum Denmark	Groby High School Leicestershire U.K.	Krokslackskolen (comprehensive) Malmö Sweden
	%	%	%	%	%
General classrooms	-	8.60	13.00	20.00	11.50
Special classrooms	-	8.40	10.00	6.00	9.00
Open-space multi-purpose activities	-	-	19.00	3.00	10.00
Laboratories	15.00	7.00	2.00	6.00	4.50
Workshops	8.00	10.00	10.00	16.60	13.50
Educational space	38.00	34.00	54.00	51.60	48.50
Libraries	8.00	6.50	9.00	5.00	2.30
Community activities (educational)	16.00	See Ed.space	-	-	-
Communal educational space	24.00	6.50	9.00	5.00	2.30
Administrative space	5.00	2.30	11.00	5.00	7.00
Communal space and services (auditorium dining rooms, etc.)	See Community activities	6.00	8.00	17.00	5.80
Toilets	3.00	2.40	1.00	4.50	3.40
Circulation (including cloakrooms)	22.00	21.00	12.00	8.00	18.80
Recreational space	-	13.90	not included	-	6.20
Sport	7.50	13.90		9.60	8.00

TABLE V

COMPARATIVE ANALYSIS OF TEACHING SPACE BETWEEN SECONDARY SCHOOLS IN VARIOUS EUROPEAN COUNTRIES

Accommodation Units	School	Code No.	No. of students per Unit	No. of Units	Net Area per Unit in M^2	Net Area per stud./place in M^2	Type of Activity	Architectural Feature	General Characteristics; Space Organization, Furniture/Equipment
Normal Classroom (General Subjects)	Mümmelmannsberg, Hamburg, Federal Rep. of Germany	1	40	4	71	1.7	Special teaching for slow learner	Independant enclosed room - fixed partition	Liberal flexibility in grouping students; fixed furniture
			30-35	15	45	1.5	Conventional blackboard teaching	Independent enclosed room - movable partition	Limited flexibility-fixed storage cabinet
			25-30	12	35	1.4	Conventional blackboard teaching	Independent enclosed room - movable partition	Limited flexibility-fixed storage cabinet
			15-20	4	25	1.5	Seminar room	Independent enclosed room - movable partition	No storage furniture
As above	Steglitz Middle-School, West Berlin, Federal Rep. of Germany	2	45	10	90	2.0	Large and small group activities	Independant enclosed room-movable partition	Liberal flexibility in grouping students; fixed storage equipment
			30	13	60	2.0	- ditto -	- ditto -	- ditto -
As above	Stavnsholt-skolen, Farum, Denmark	3	30-35	13	46	1.5	Large, medium & small group lecture room and individual work	Open-plan school. This space part of an overall teaching space including practical activities. Movable partition.	Liberal flexibility in grouping students. Storage equipment and furniture all movable.
			15-20	16	23	1.5	- ditto - (including seminar)	- ditto -	- ditto -

COMPARATIVE ANALYSIS OF TEACHING SPACES BETWEEN SECONDARY SCHOOLS IN VARIOUS EUROPEAN COUNTRIES (Continued)

Accommodation Units	School	Code No.	No. of students per Unit	No. of Units	Net Area per Unit in M^2	Net Area per stud./place in M^2	Type of Activity	Architectural Feature	General characteristics; Space Organization; Furniture/Equipment
Normal Classroom (General Subjects) Continued...	Groby High-School, Leicester-shire, U.K.	4	60 or 30	4 or 8	85 or 42	1.4	Large and small group lecture room and practical activities	Enclosed space with movable dividing partition	Liberal flexibility in grouping students; fixed equipment
			30	4	62	2.0	Home base for practical teaching	Enclosed space with movable partition	- ditto -
			15	4	40	2.5	Lecture room with desk studies; seminar room	Enclosed space with fixed partition	- ditto - (also fixed, though limited, equipment)
			6 to 8	2	15	2.0	Quiet room, individual desk studies	- ditto -	Limited flexibility; no equipment
As above	Kroksback-skolen, Malmö, Sweden	5	60	1	70	1.1	Conventional blackboard teaching. Large and middle group lecture room.	Enclosed space. Room has movable dividing partition.	Liberal flexibility in the groupment of pupils. Movable furniture; limited equipment.
			40	2	68	1.7			
			20	2	30	1.5			
			12	1	16	1.4	Seminar room	Enclosed space	

COMPARATIVE ANALYSIS OF TEACHING SPACES BETWEEN SECONDARY SCHOOLS IN VARIOUS EUROPEAN COUNTRIES (Continued)

Accommodation Units	School	Code No.	No. of students per Unit	No. of Units	Net Area per Unit in M2	Net Area per stud./place in M2	Type of Activity	Architectural Feature	General characteristics; Space Organization; Furniture/Equipment
General Working Area	Mümmelmannsberg, Hamburg, Fed. Rep. of Germany	1	One-year base 300	One used in turn	576	1.9	Complementary to lecture room. Desk study, individual or group. Seminar room.	Enclosed wide space; No partition	No equipment
As above	Steglitz, West Berlin, Fed. Rep. of Germany	2	N o t A v a i l a b l e						
As above	Stavnsholtskolen, Farum, Denmark.	3	60	4 per home base	126	2.0	Complementary to class group base (see normal classroom for desk study in individual or groups). Seminar room.	Open plan school; main space allocated to year base	Movable equipment
As above	Groby High-School, Leicestershire, U.K.	4	60	4	85	1.4	Complementary to class group base (see normal classroom) by merging the 2 rooms separated by movable partition	Enclosed wide space; No partition	Fixed equipment
As above	Kroksbackskolan, Malmö, Sweden	5	300 (2-year base)	1	652	2.2	Complementary to class-group base, for individual or group work	Open-plan; No partition	Movable equipment and furniture.
			80	1	245	3.0			

COMPARATIVE ANALYSIS OF TEACHING SPACES BETWEEN SECONDARY SCHOOLS IN VARIOUS EUROPEAN COUNTRIES (Continued)

Accommodation Units	School	Code No.	No. of students per Unit	No. of Units	Net Area per Unit in M²	Net Area per stud./place in M²	Type of Activity	Architectural Feature	General characteristics; Space Organization; Furniture/Equipment
Science Laboratory	Mümmelmannsberg, Hamburg, Fed. Rep. Germany	1	30	18	76	2.5	Lecture-demonstration + practical exercise	Enclosed space; fixed partition	Service island with mobile tables placed in various positions
As above	Steglitz, West Berlin, Fed. Rep. of Germany		60	1	78	1.3	Lecture theatre with demonstration	Enclosed mobile demonstration table	Tiered seating
		2	30	3	48	1.6	- ditto -		
			30	5	92	3.0	Practical activities	Enclosed space; service-islands	Fixed service islands with mobile tables for practice
			20	2	48	2.4	- ditto -	- ditto -	- ditto -
As above	Stavnsholtskolen, Farum, Denmark	3	30	1	104	3.5	Lecture demonstration and practical exercise	Enclosed space; 2-part: (a) lecture-demonst. (b) practice	Lecture demonstration on tiers; practice: service islands and mobile tables
As above	Groby High-School, Leicestershire, U.K.	4	30	4	75	2.5	Lecture-demonstration & practice	Enclosed space; benches and services placed alongside walls	Mobile tables
	Kroksbackskolen, Malmö, Sweden	5	30	3	80	2.6	Lecture, demonstration and practice	Enclosed space	Benches placed alongside walls; mobile tables.

COMPARATIVE ANALYSIS OF TEACHING SPACES BETWEEN SECONDARY SCHOOLS IN VARIOUS EUROPEAN COUNTRIES (Continued)

Accommodation Units	School	Code No.	No. of students per Unit	No. of Units	Net Area per Unit in M^2	Net Area per stud./place in M^2	Type of Activity	Architectural Feature	General characteristics; Space Organization; Furniture/Equipment
Library	Mümmelmannsberg, Hamburg, Fed. Republic of Germany	1	200	1	1,370	6.8	Public Library: Students/community + staff	Open-plan area; natural and artificial lighting	Includes: reading area;* seminar room; information; audio visual; librarian's office; services (repair, etc.) shelving area; toilets.
As above	Steglitz, West Berlin, Fed. Republic of Germany	2	150	1	1,051	7.0	Public library: students, staff and community	Open-plan area; mostly artificial lighting	- ditto* - + 3 seminar rooms study carrels ... ...
As above	Stavnsholtskolen, Farum, Denmark.	3	90	1	620	6.8	School library, including services	Open-plan area; natural lighting (window & skylight)	- ditto* - + 1 seminar room; 1 reproduction room; 1 photo. laboratory; + booth for students
As above	Groby High-School, Leicestershire, U.K.	4	50	1	165	3.3	School library	Open-plan area; natural and artificial lighting	Includes: catalogue/reading room; shelving; librarian desk;
As above	Kroksbackskolen, Malmö, Sweden	5	60	1	150	2.5	Included in High School general working area	Open-plan area; artificial lighting	Includes: catalogue/reading room; shelving; librarian's office

COMPARATIVE ANALYSIS OF TEACHING SPACES BETWEEN SECONDARY SCHOOLS IN VARIOUS EUROPEAN COUNTRIES (Continued)

Accommodation Units	School	Code No.	No. of students per Unit	No. of Units	Net Area per Unit in M²	Net Area per stud./place in M²	Type of Activity	Architectural Feature	General characteristics; Space Organization; Furniture/Equipment
Workshops and Design Centre	Mimmelmannsberg, Hamburg, Fed. Republic of Germany	1	16	13	Total: 1,370	6.5	Wood; metal; ceramics; art; drawing; home economics; soldering; auto-repair. (All workshops for school & community use)	Each workshop enclosed space; natural and artificial lighting	Fixed benches; complete and sophisticated equipment.
As above	Steglitz - Middle School West Berlin, Fed. Republic of Germany	2	16	12	Total: 1,315	6.8	All workshops for school and community use include: wood & metal machine shop; topography & measure; electro-technic; home economics; drawing (art & technical)	Each workshop enclosed space; artificial and natural lighting	Fixed benches; complete and sophisticated equipment.
As above	Stavnsholt-skolen, Farum, Denmark.	3	15	8	Total: 887	7.4	For school use only· includes: wood & metalwork; masonry; art; ceramics; home economics	Open-plan area; with some window partitions; natural lighting: window & skylight	Movable benches & tables, simple but complete equipment
As above	Groby High-School, Leicester-shire, U.K.	4	15	9	555	4.1	For school use only, includes: wood & metalwork general / practical; arts & crafts; ceramics; home economics	Open-plan in one block. Platforms and glass partitions as dividers. Natural (skylight) lighting.	Movable benches and tables. Simple but complete equipment
As above	Kroksback-skolan, Malmö, Sweden	5	20	12	Total: 1,140	4.7	Wood, metal, ceramics, decoration, film, homecraft, home economics, textiles, etc.	Open plan area divided by shelving.	Movable benches; and tables. Complete equipment.

TABLE VI

COMPARATIVE ANALYSIS BETWEEN SECONDARY SCHOOLS IN VARIOUS EUROPEAN COUNTRIES

EDUCATIONAL AND ARCHITECTURAL CHARACTERISTICS

SCHOOL	EDUCATIONAL FEATURES	ARCHITECTURAL FEATURES
Mümmelmannsberg, Hamburg, Federal Rep. of Germany Constructed: 1972	Integrated middle and high school and multi-option community centre. Full-day school: 8 am. to 4 pm. Total capacity : 2,400 pupils: grade 5 to 13 Intake : 300 pupils Organization : 9 streams - 3 in basic unit 6 integration of basic and vocational training. From Grade 9, each student selects from 15 optional courses. Community Centre: all school facilities are at the disposal of the community after 6 pm. Youth Club opens daily from 8 am. to 10 pm.	Three-storied reinforced concrete building with standardized panelling. Ground Floor : Youth Club communal activities. Natural Science Department and part of Vocational Education. First Floor : School facilities : classrooms, auditorium, language laboratory. Part of Science and Vocational Education. Public Library. Gymnasium. Third Floor : Administration "Schulestrasse" concept : large circulating 'spine' leading into all areas. In addition to common room, the staff have a workroom (8 places) with individual desks. Communication between Secretariat and other rooms is by interphone. All school elements are identified by a specific colour.
Steglitz - Middle School, West Berlin, Federal Rep. of Germany Constructed: 1973-74	Integrated middle-school and Community Centre : Full-day school. Total capacity : 1,200 pupils: grade 7 to 10 Intake : 360 pupils Organization : 10 streams (parallel) 7-8th grade : in home room system 9-10th " : in subject room system Divided into : - Large-group instruction or Department : half of complete grade : 120-180 pupils. - Core-group: 5 in one Dept. : 20-30 pupils - Small-group instruction : 10-15 pupils Community Centre: Public Library and workshops at the disposal of the community after school hours. Lower level: special facilities for community and adult education	Two-three storied split-level building with vertical communication in between; centrally located. "Schulestrasse" divides school between teaching aisle (3-storey) and communal aisle (2-storey). Central staff room - one per year base with space for individual work. Central resource area for team planning or individual work. Each year-group has its own indoor recreation area with allotted space for games or rest-break. Construction grid: 7.20 metres.

COMPARATIVE ANALYSIS BETWEEN SECONDARY SCHOOLS IN VARIOUS EUROPEAN COUNTRIES
EDUCATIONAL AND ARCHITECTURAL CHARACTERISTICS (Continued)

SCHOOL	EDUCATIONAL FEATURES	ARCHITECTURAL FEATURES
Stavnsholtskolen Farum, Denmark Constructed: 1971	Comprehensive, full-day school Total capacity : 900 pupils from kinder-garten to 10th grade. Intake : 120 pupils Organization : 5 units (primary school + 4 units secondary school); Each unit: 6 class-groups of 30 or 180 pupils, total.	One-storey "school-street" divides building into academic subjects, teaching space and special subjects (workshops, laboratories, languages, music, etc.). Construction: square grid of laminated wooden beams (on columns: 9.60 x 9.60 meters per grid) which creates a coffer roof on basic module 2.40 cm. Extensive use of skylight. Partition easily installed and/or removed along the ceiling grid. Each unit has its own hall-common room, classrooms, working area, staff room, library, kitchen, store and toilet block, outdoor area. There are staff "quarters": a wide space at the disposal of the staff for rest periods, individual desk study, conferences and catering (kitchen, staff dining room and patio).
Groby High School, Leicestershire, U.K. Constructed: 1975	Full-day school. Total capacity (when in full operation) : 720 pupils, grade 8-9-10th. Intake : 240 pupils Organization (when in full operation) : 18 streams (6 per year) of 40 pupils each Home year base system : 240 pupils divided into: Large group: 120 pupils Middle group: 30-40 pupils Small group: 15-20 pupils	One-storey building. Reinforced concrete structure. Teaching space includes 4 autonomous blocks around library area. Present arrangement: 1st block: Humanities - 6 rooms 2nd block: Special education - 6 rooms including: laboratory: room for the slow-learner. Mathematics; Science. 3rd block: Languages and Science: 7 rooms including: 3 laboratories and preparation rooms. 4th block: Design Centre with 8 areas for vocational education: Arts and Crafts / Ceramics General Practice / Needlework Woodwork / Dressmaking Metalwork / Home Crafts A 5th block for communal services includes: Assembly Hall (dining and services) / Gymnasium and cloakroom Lecture Theatre / Music room with booths Drama Studio Administration Some rooms are with sliding partitions. Good use of natural lighting through skylight.

COMPARATIVE ANALYSIS BETWEEN SECONDARY SCHOOLS IN VARIOUS EUROPEAN COUNTRIES
EDUCATIONAL AND ARCHITECTURAL CHARACTERISTICS (Continued)

SCHOOL	EDUCATIONAL FEATURES	ARCHITECTURAL FEATURES
Kroksback-skolan, Malmö, Sweden Constructed: 1971-72	Comprehensive, full-day school. Total capacity : 900 from 1st to 12th grade Intake : 120 pupils Organization : Primary School: Groups of: 25 pupils 150 pupils : Middle School: Groups of: 30 pupils 270 pupils : High School Groups of: 30 pupils 450 pupils Three middle schools in the area serve as feeder schools for the higher level.	One-storey building : steel structure and reinforced concrete slabs. 4 different blocks : (a) high school block (b) primary and middle school block (c) sports, dining and leisure centre block (d) administration block (a) and (b) blocks are designed as open-plan schools. All partitions can be removed. Carpeted floor and sound-proofed ceiling. All sanitary facilities equipped to receive handicapped children. All enclosed classrooms have dividing sound-proofed sliding partitions for sub-division into two-classgroup activities. The leisure centre is organized for children of working parents. The children stay on after school hours until they are collected by parents each evening. There are reading and games rooms, handicraft activities, table-tennis, etc.

TABLE VII

REVALUATION OF EDUCATIONAL AND ARCHITECTURAL CHARACTERISTICS

SCHOOL	ARCHITECTURAL FEATURES		COMMENTS/OBSERVATIONS BY PARTICIPANTS
	ADVANTAGES	DISADVANTAGES	
Mimmelmanns-berg, Hamburg, Federal Rep. of Germany Constructed: 1972	Private architectural firm has a permanent office within the premises for supervisory purposes regarding Second Phase. This provides them with an on-the-spot evaluation of present accommodation. Second prototype (after Steilshoop). This school has benefited from the experience of Steilshoop - better concentration, more control with regard to natural lighting and ventilation. Reasonable amount of flexibility despite rigid standardization. School not fully operative; Second phase of construction has, as yet, to commence. Present enrolment : 800 students	Running costs not yet available; but presumably rather high. Too many facilities are still dependent upon artificial lighting. Despite colourful and functional polychromy, atmosphere is dull.	Communication between different areas (particularly between floors) is difficult. Co-operation and co-ordination between school staff and supervisors of community activities has still to be improved.
Steglitz Middle School, West Berlin, Federal Rep. of Germany Constructed: 1973-74	Winning design of a local competition. Interesting split-level organization with central vertical circulation. Considerable sample of specialized rooms. Good separation between school and community development activities.	Apparently, the experts and future participants concerned were not often consulted during the planning and design phase (before competition actually took place). Also, while standardization of buildings was required, the urban situation (i.e. adequate and available sites) was not taken into account by the competitors. Therefore, 7 out of 10 sites required special solutions, thereby increasing costs and reducing efficiency of standardization. High percentage of rooms without natural lighting or adequate ventilation.	The main complaint is the high percentage of teaching facilities without natural lighting or proper ventilation. Apparantly, the authorities intend to solve this defect by providing multi-storey buildings during the next phase. The school authorities are extremely concerned with regard to high running costs, also damage caused by vandalism.

REVALUATION OF EDUCATIONAL AND ARCHITECTURAL CHARACTERISTICS (Continued)

SCHOOL	ARCHITECTURAL FEATURES		COMMENTS/OBSERVATIONS BY PARTICIPANTS
	ADVANTAGES	DISADVANTAGES	
Stavnsholt-skolen, Farum Denmark Constructed: 1971	Good distribution of space; Apart from the "school street", there is almost no circulation area. No apparent wasted space. High flexibility. All partitions removable and most of the furniture is mobile. Very good distribution of natural lighting through use of sky-light as well as windows. Room and furniture scale well-fitted for pupils. Good wind protection - ample space for outdoor activities. Wide area at disposal of staff (used as staff quarters and patio).	Noise level in teaching areas slightly above average. One-level school necessitates expanded site-area (this being a suburban school).	Organization of space and flexibility. Well conceived to serve individual requirements from teachers. (In this open-plan school), some teachers have re-established the traditional enclosed classroom.
Groby High School, Leicester-shire, U.K. Constructed: 1975	Well concentrated distribution of space. Liberal amount of flexi-bility in each block. Good partitions of natural light by use of skylight when and where required.	High concentration of pupils in Humanities Block due to placement of large sized tables for group activities. Main access to year base blocks is by way of the Administration area and through Library which causes disturbance to the occupants of both.	Head of school was obliged to set out a series of instructions and circulate these within the school to avoid disturbance in Admini-stration and Library area (see previous column). Leicestershire Country Council authorities may have to stop the use of skylight in school construc-tion. The resultant heat waste increases heating expense.

REVALUATION OF EDUCATIONAL AND ARCHITECTURAL CHARACTERISTICS (Continued)

SCHOOL	ARCHITECTURAL FEATURES		COMMENTS/OBSERVATIONS BY PARTICIPANTS
	ADVANTAGES	DISADVANTAGES	
Kroksback-skolen, Malmö, Sweden Constructed: 1971-72	Good organization of independent blocks by level : primary, middle and high school. Adequate distribution of natural lighting by addition of skylight where necessary and inside patios. Ver. large areas (15% of total) organized in open space. Efficient sound-proofed ceiling. Large flexibility in the organization of space	Lower and middle level: insufficient space for cloakroom. Ventilation of rooms appears to be inefficient.	Some teachers would prefer to enclose part of the open space. Complaints about disturbance created by circulation area nearby.

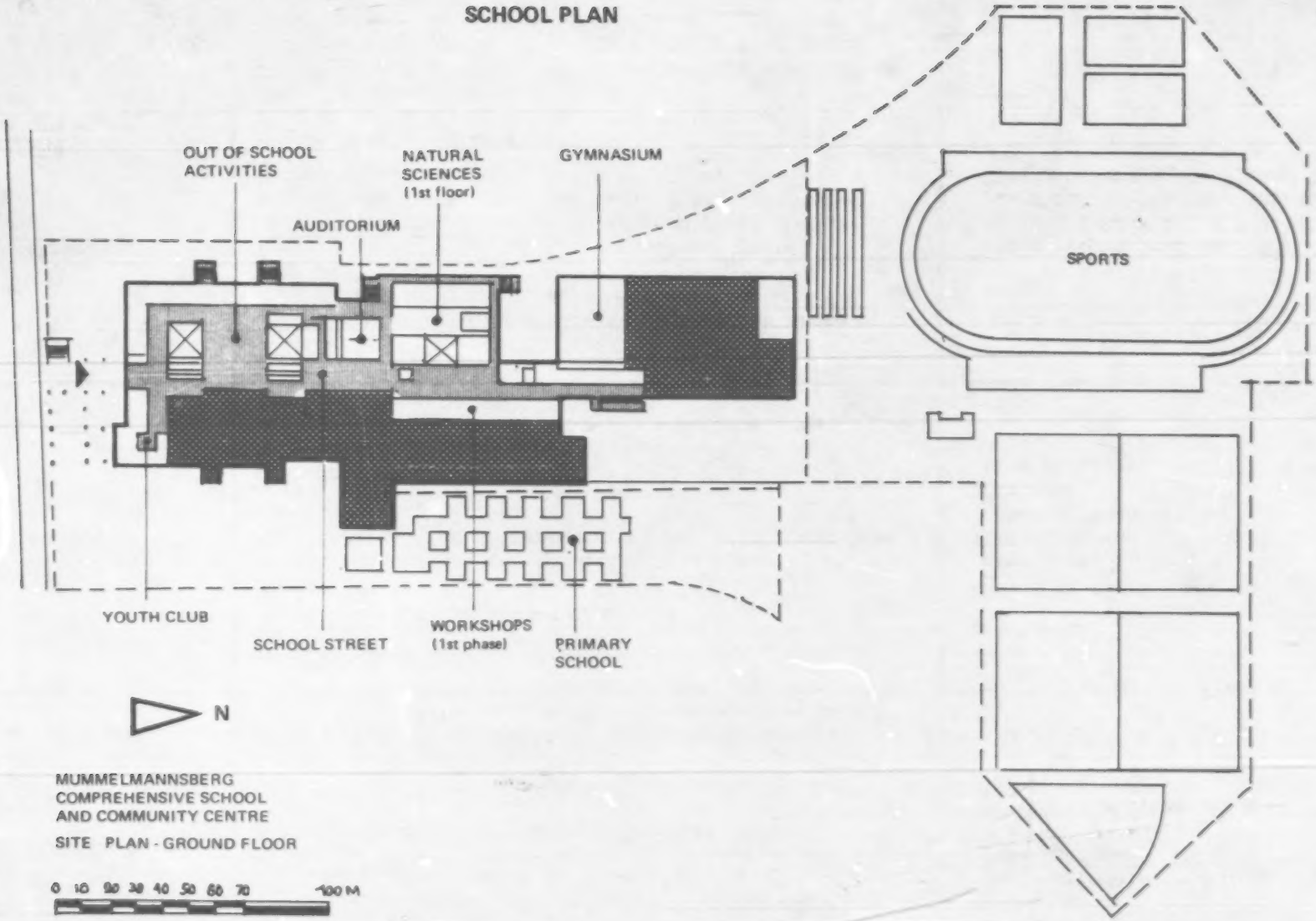
TABLE VIII

A FEW EXAMPLES OF FURNITURE AND EQUIPMENT FOR EDUCATIONAL INNOVATION

NAME OF SCHOOL	FURNITURE	EQUIPMENT
Steglitz Middle School, West Berlin, Federal Republic of Germany. SCHULBAU INSTITUT DER LANDER Architects: K. BROHN & W. KORTH R. GOLAN & W. POHL I. KRUSNIK, REIT & J. WIESE S. KLOSE & K.R. PANKRATH R. POLY & D.STEINEBACH	Service island for science laboratory 50cm x 50cm H= 90cm. Metal frame and plate equipped with connectors to gas, electricity, water and waste networks. Electrical panel with set of various types of plug: 110/130 volts and 220/240 volts, disconnector, etc. (See photograph No.8). Work table for sewing course 120 cm x 60 cm H= 72cm. Metal frame with wooden top covered with Neoprene. Electric sewing machine stored inside compartment underneath table top. The machine, fixed to a plate, is pulled out into working position by sliding the table top aside and pivoting the plate into position. (See photograph No.10).	"JOKS" : A playground swing. This is a large, cradle-type swing, made of plastic sheeting and fixed on a tubular frame. (See photograph No.15).
Stavnsholtskolen, Farum, Denmark Architects: OLE PARK & OLSEN, Copenhagen.	Multi-purpose mobile furniture The document entitled "MOBILT SKOLE INVENTAR" shown in Annex III is a catalogue of school furniture from a firm in Copenhagen, especially designed by the school architect: Mr. Ole Park. The multiple combinations are well suited to the educational requirements: simple, well thought-up and functional. Woodwork bench with service island The four individual work benches set out crosswise fashion are fixed to a control table (square-shaped) for temporary storage of tools and materials. (See photograph No.26). Science laboratory furniture Use of service island for practical exercises, lecturing and demonstration. Retractable chairs and narrow tables displayed in tiers. (See photograph No.23). Adjustable shelving: all shelving is fixed alongside adjustable racks to the required height. (See photograph No. 25).	

NAME OF SCHOOL	FURNITURE	EQUIPMENT
Groby High School, Leicestershire, U.K. Architects: Leicestershire County Council, Architect's Department.	Design Centre: Storage of tools and material for Arts and Crafts. One set of six elements : Total: 420cm.x 45cm. H = 90cm. 30 wooden frame case-drawers. Hard top used for workbench or display. (See photograph No.31). Stand for display Wooden frame with adjustable shelving of varying depths for display of models. (See photograph No.32).	Small-sized individual looms. (See photograph No.31). Portable printing press
Kryddgardskolen, Secondary School, Malmö, Sweden	Wood workshop 5th grade individual work bench Wooden frame: 45cm x 140cm (height adjusting); Wooden bench vice, incorporating tool box; Well designed for different groupings with 2 and 4 sets. (See photograph No.49). Tool storage Hung on walls (one set per type of tool. Also panoply of individual tools for occasional use. (See photograph No.49).	Electrical plugs (set of 110 volts and 230 volts) inserted into ceiling fixture. (See photograph No.49)
Kroksbackskolen, Malmö, Sweden. Architects: DAHL & STROMDAHL, Malmö	Tables Semi-circular type adaptable to rectangular shape, well suited to group discussion. (See photograph No.43). Individual box - for stationery and equipment, made of plastic, is allotted to each pupil who is responsible for his/her own box. These boxes are stored in low cupboard when not in use. Mobile panels - (on wheels) Used as movable blackboard, or partitioning. (See photograph No.44). Cloakroom - Individual hangers on movable steel frame combined with lattice-type crate for storing shoes. This equipment stands at 20 cm. above floor-level. (See photograph No. 45).	Wooden frame beam suspends from ceiling into which all electrical plugs in the room are inserted. (See photograph No. 43 and 46).

SCHOOL PLAN



MUMMELMANNSBERG
COMPREHENSIVE SCHOOL
AND COMMUNITY CENTRE

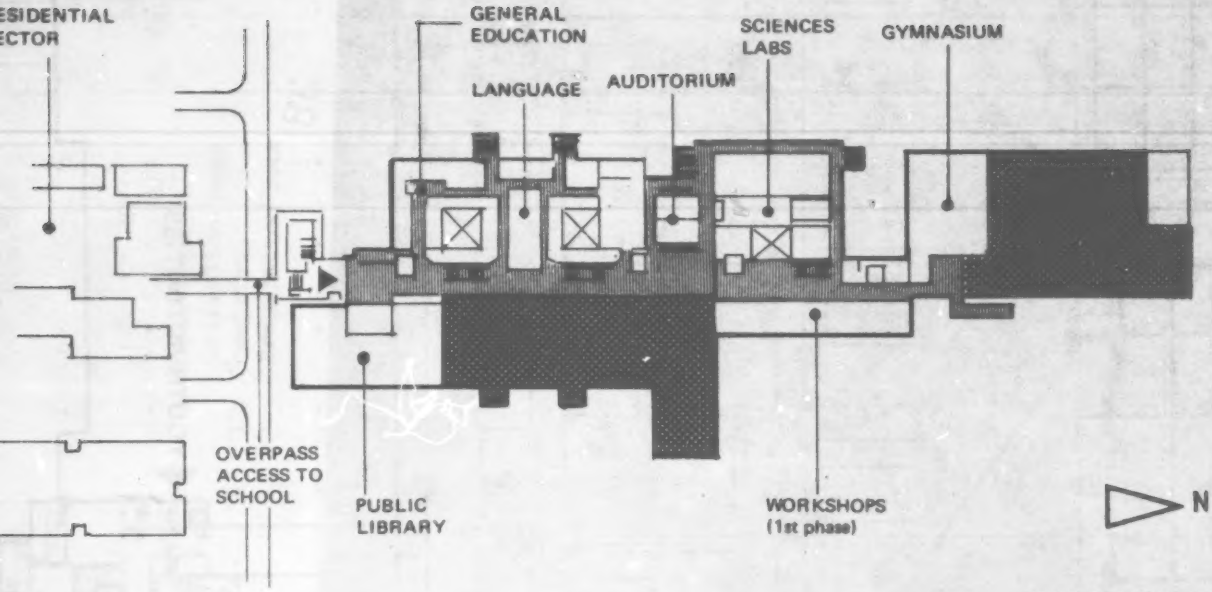
SITE PLAN - GROUND FLOOR

0 10 20 30 40 50 60 70 100 M

PROJECTED EXTENSION

Architects: GRAAF SCHWEGER & Partners

SCHOOL PLAN



MUMMELMANNSBERG
COMPREHENSIVE SCHOOL
AND COMMUNITY CENTRE

FIRST FLOOR

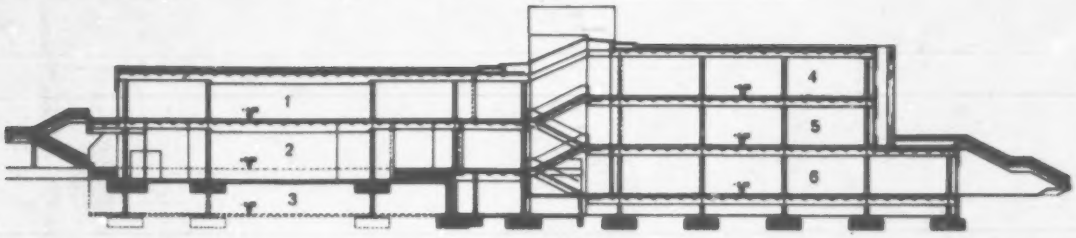
0 10 20 30 40 50 100 M

FUTURE EXTENSION

AND COMMUNITY CENTRE

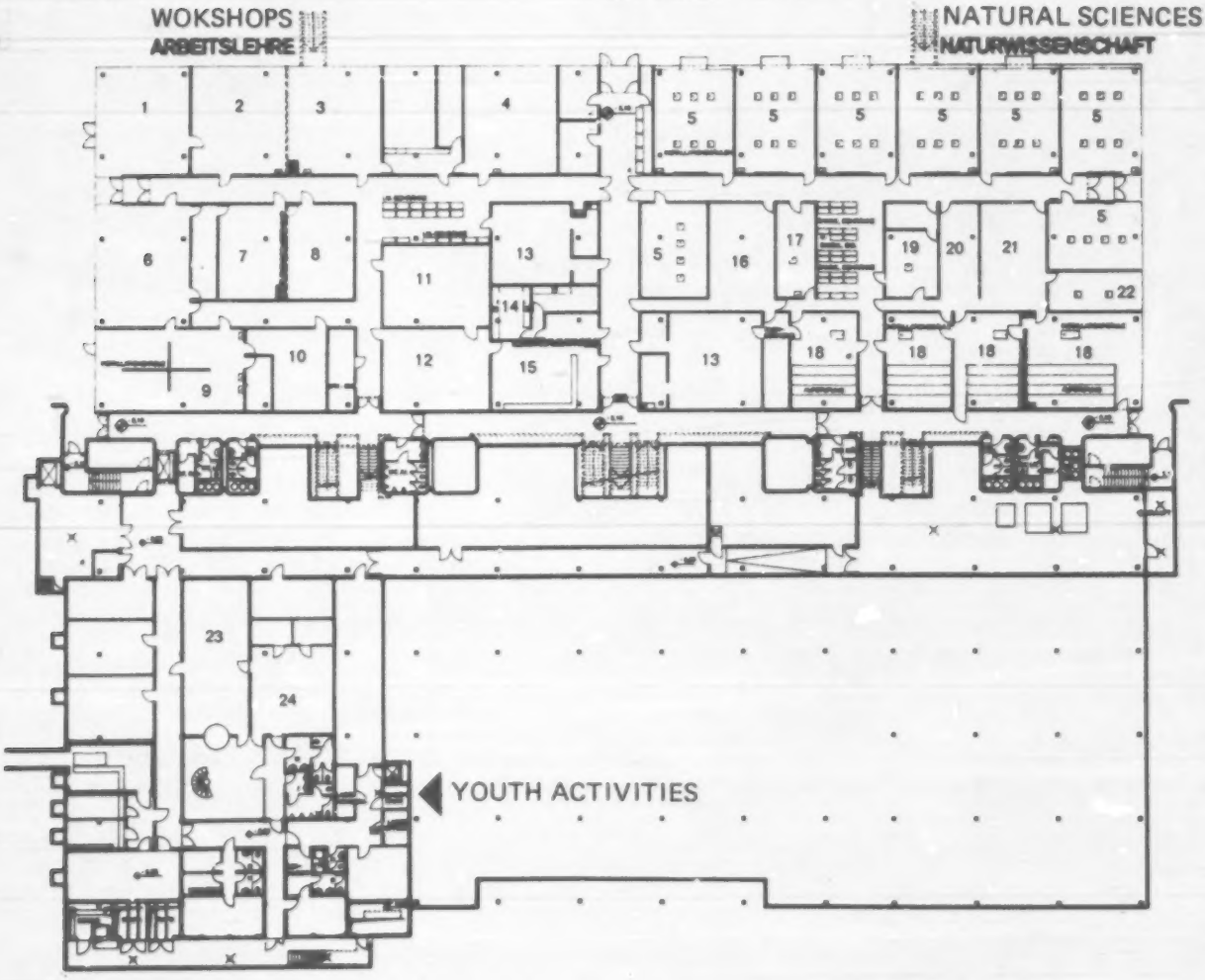
WEST BERLIN,
FEDERAL REPUBLIC OF GERMANY.

CROSS SECTION AND PLAN : Level ± 000 and - 2.10



1 Mediothek
2 Mensa
3 Freizeiträume

4 Deutsch
5 Planungszentren
6 Naturwissenschaften



1. Machine shop
(2. 3. (& 4. Workshop: wood & metal
5. Science Laboratory (practice)
6. Textiles
7. Electricity
8. Electricity (storage)
9. Cookery Unit
10. Home crafts
11. Typing room
12. Accountancy room
13. Staff room
14. Photography laboratory
15. Printing press
16. Chemistry: Collection room
17. Chemistry: Preparation room
18. Lecture-Demonstration
19. Biology: Preparation room
20. Biology: Collection room
21. Physics: Collection room
22. Physics: Preparation room
23. Studio broadcasting-Discothèque
24. Table Tennis room

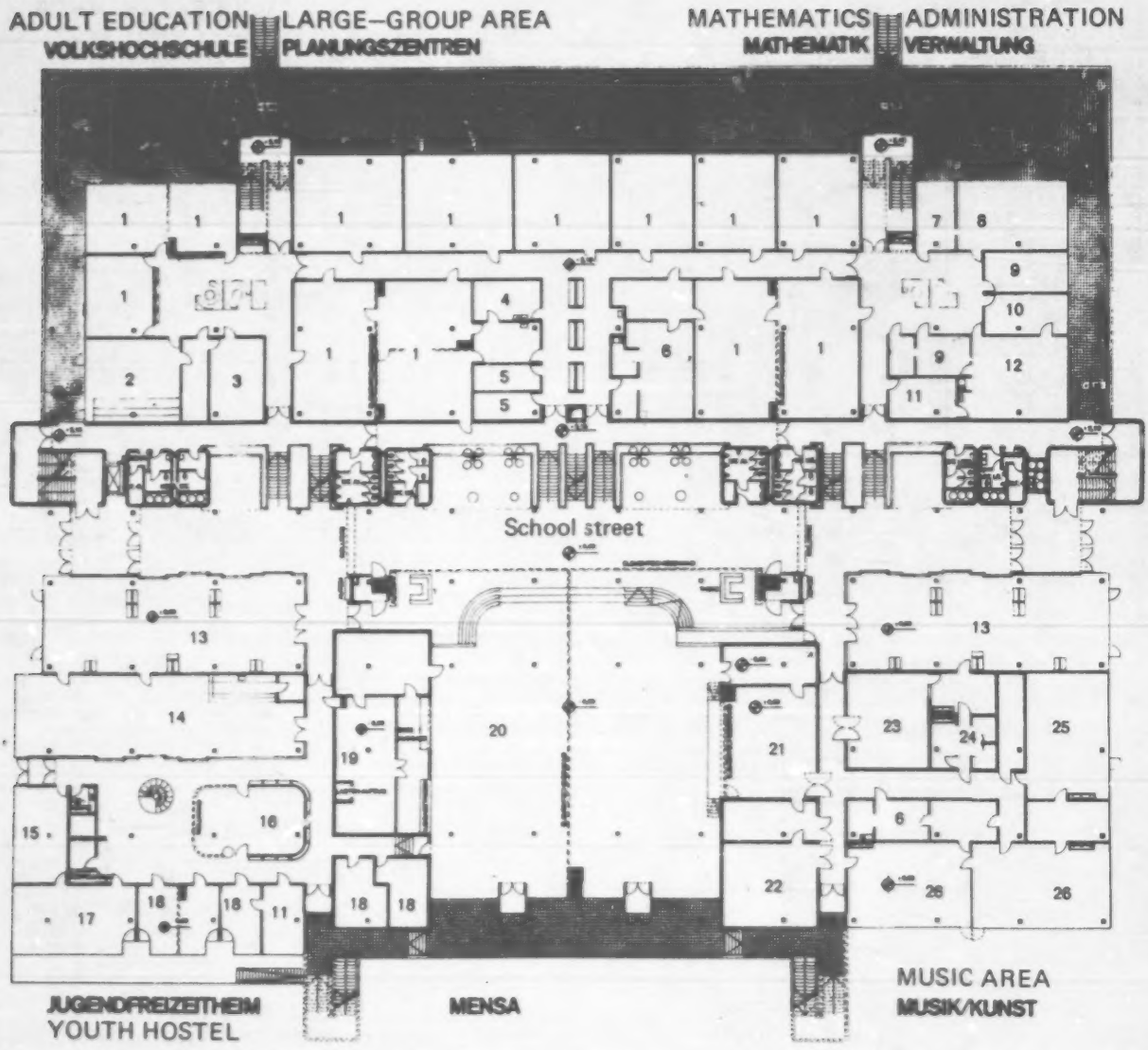
pg. 4

AND COMMUNITY CENTRE

WEST BERLIN,

FEDERAL REPUBLIC OF GERMANY

PLAN : Level: ± 000 and 2.10

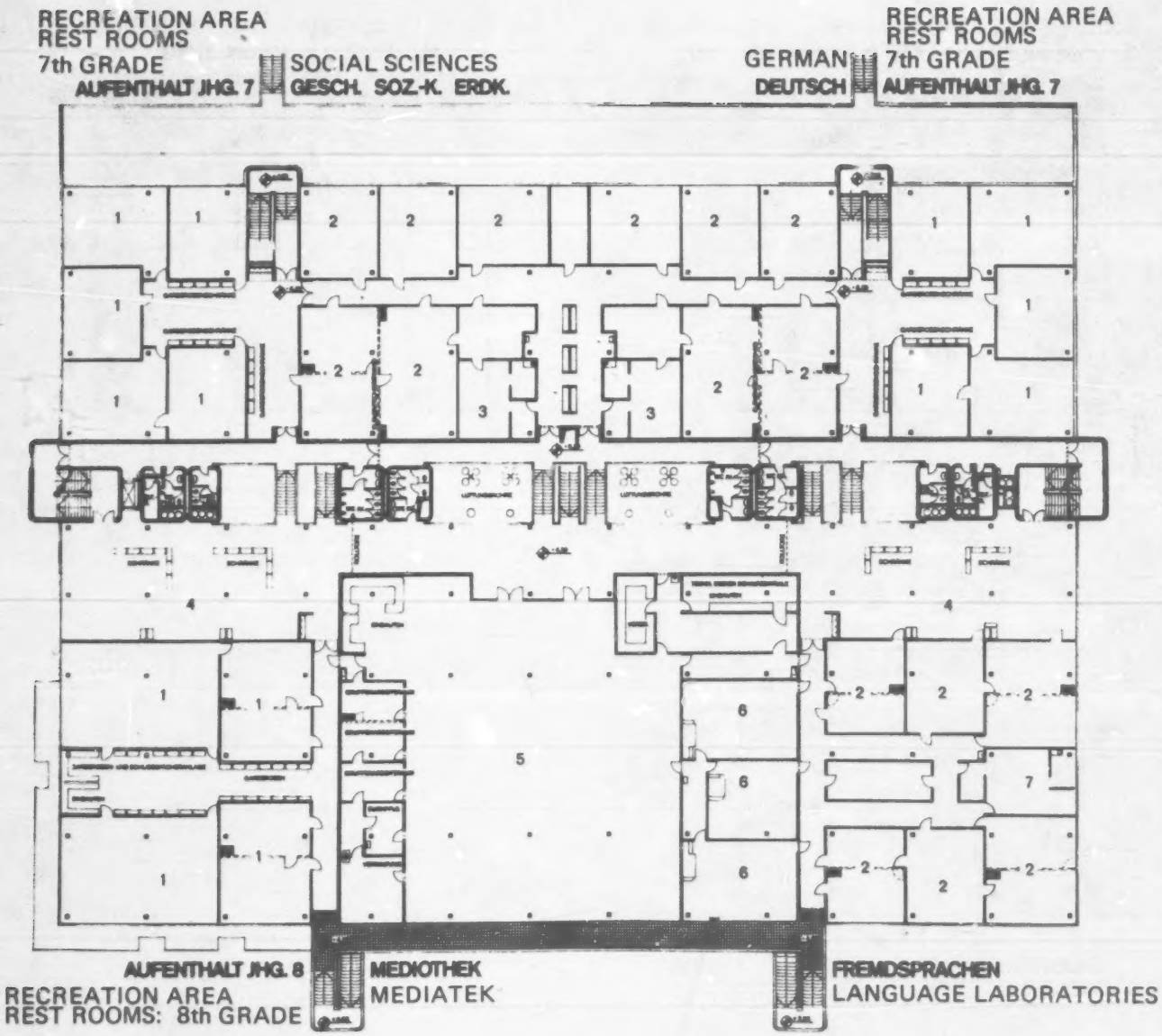


1. General classroom
2. Lecture demonstration
3. Administrative unit
4. Clinic
5. Tutorial room
6. Staff work room
7. Psychologist
8. Staff common room
9. Deputy Headmaster's room
9A. Deputy Headmaster's room
10. Headmaster's room
11. Conference room
12. Secretariat
13. Students' common room
14. Snack Bar
15. Workshop
16. Discussion room
17. Recreation room
18. Seminar room
19. Kitchen
20. Dining area
21. Music room
22. Choir practice room
23. Broadcasting studio
24. Music practice booths
25. Orchestral practice room
26. Technical drawing rooms

AND COMMUNITY CENTRE

WEST BERLIN,
FEDERAL REPUBLIC OF GERMANY.

PLAN : Level: + 4.20 and 6.30

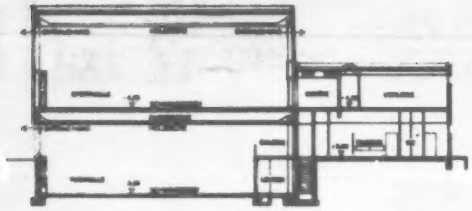


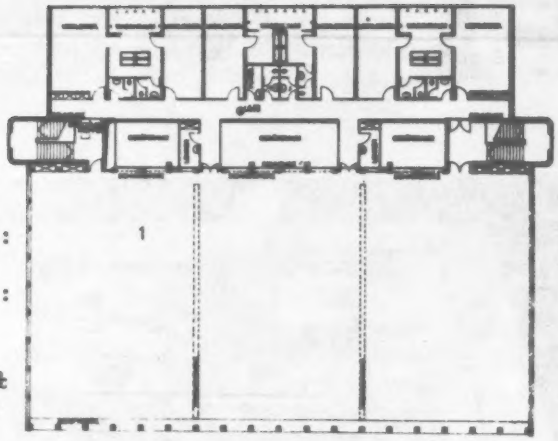
1. Home Base : Rest and recreation rooms
2. Classrooms
3. Staff Room
4. Recreation Area : Common rooms
5. Library
6. Language laboratories
7. Staff Room.

AND COMMUNITY CENTRE

WEST BERLIN,
FEDERAL REPUBLIC OF
GERMANY.

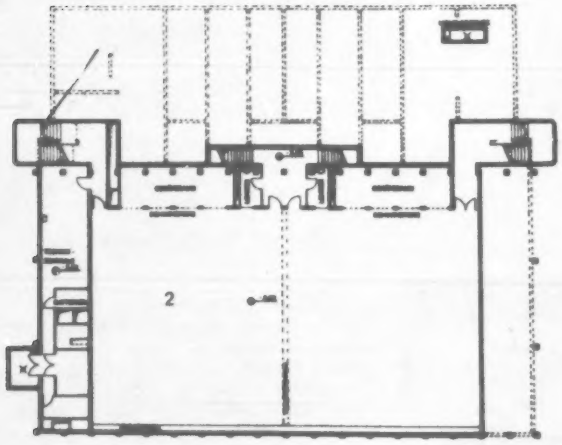
TWO-FLOOR GYMNASIUM

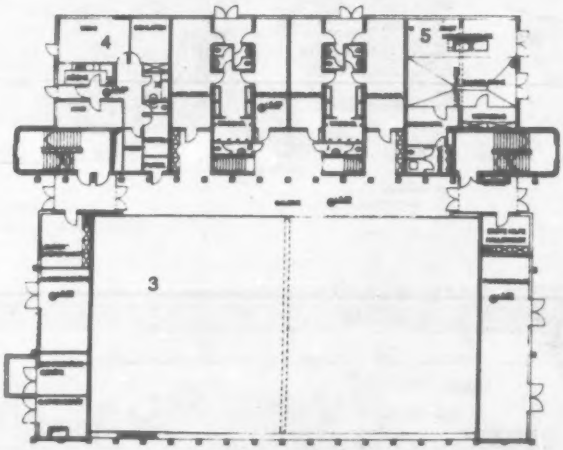


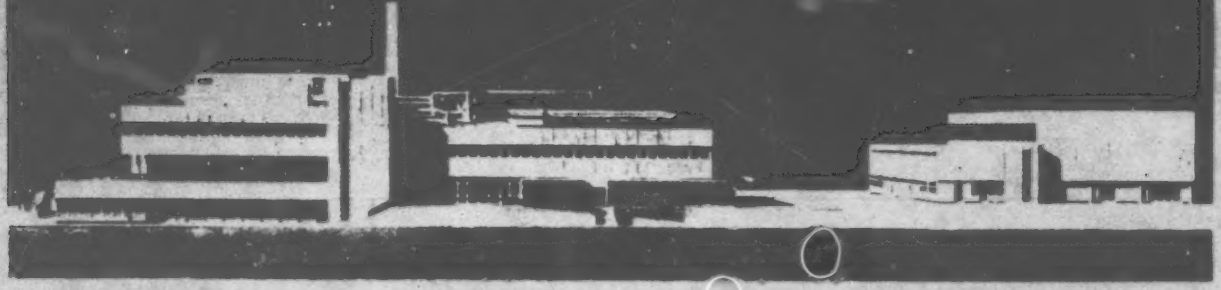


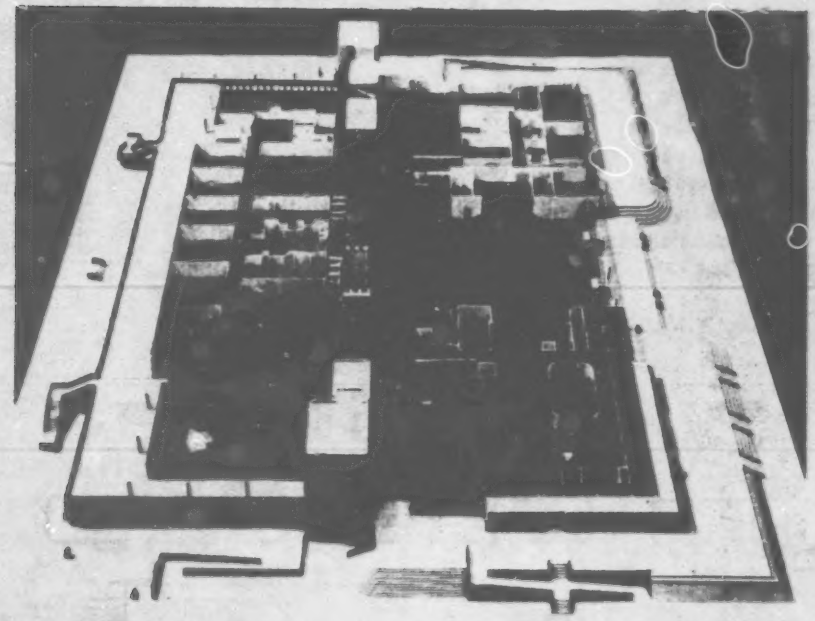
1. Gymnasium: Upper level: - Sports
2. Gymnasium: Lower level: Physical Education
3. Lower level : Gallery & Cloakrooms
4. Headmaster's flat
5. Heating plant.

1 Sporthalle
2 Turnhalle
3 Luftraum Turnhalle
4 Hausmeister-Wohnung
5 Motorenwerkstatt

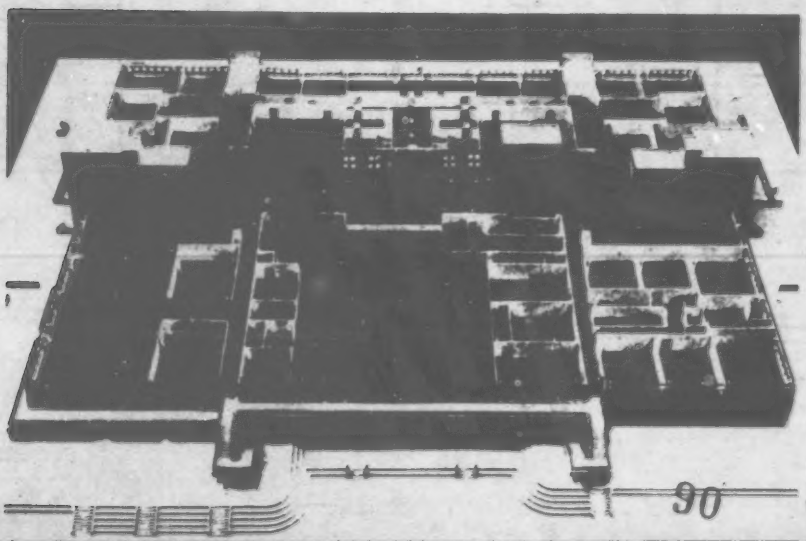








Grundtyp der Bildungszentren



Daran beteiligte Architekten:
PBZ — Planungsgruppe Bildungszentren
Brohm — Kohrth,
Golan — Pohl
Krusnik — Wiese
Pankrath — Klose
Poly — Steinebach

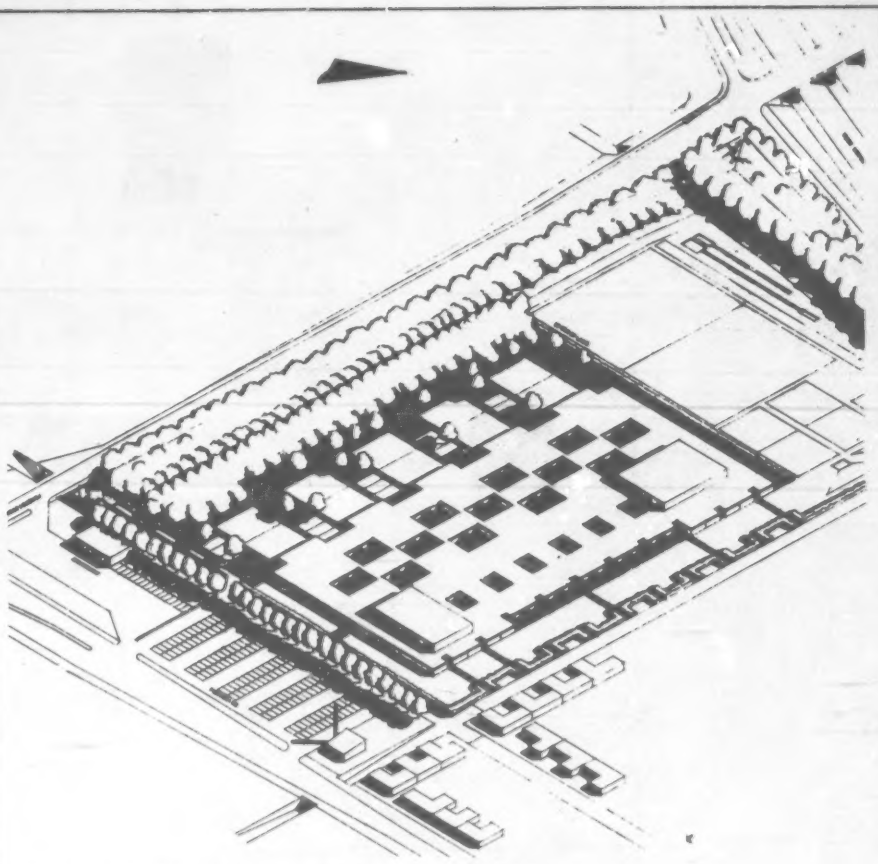
Bild 14 (ganz oben): Modell, Haupteingang mit Jugendfreizeitheim

Bild 15 (oben): Modell, Jugendfreizeitheim mit Mensa

Bild 16 (links Mitte):
Modell, Ebene ± 0 / + 2,10

Bild 17 (links): Modell, Ebene + 4,20 / + 6,30

SCHOOL PLAN



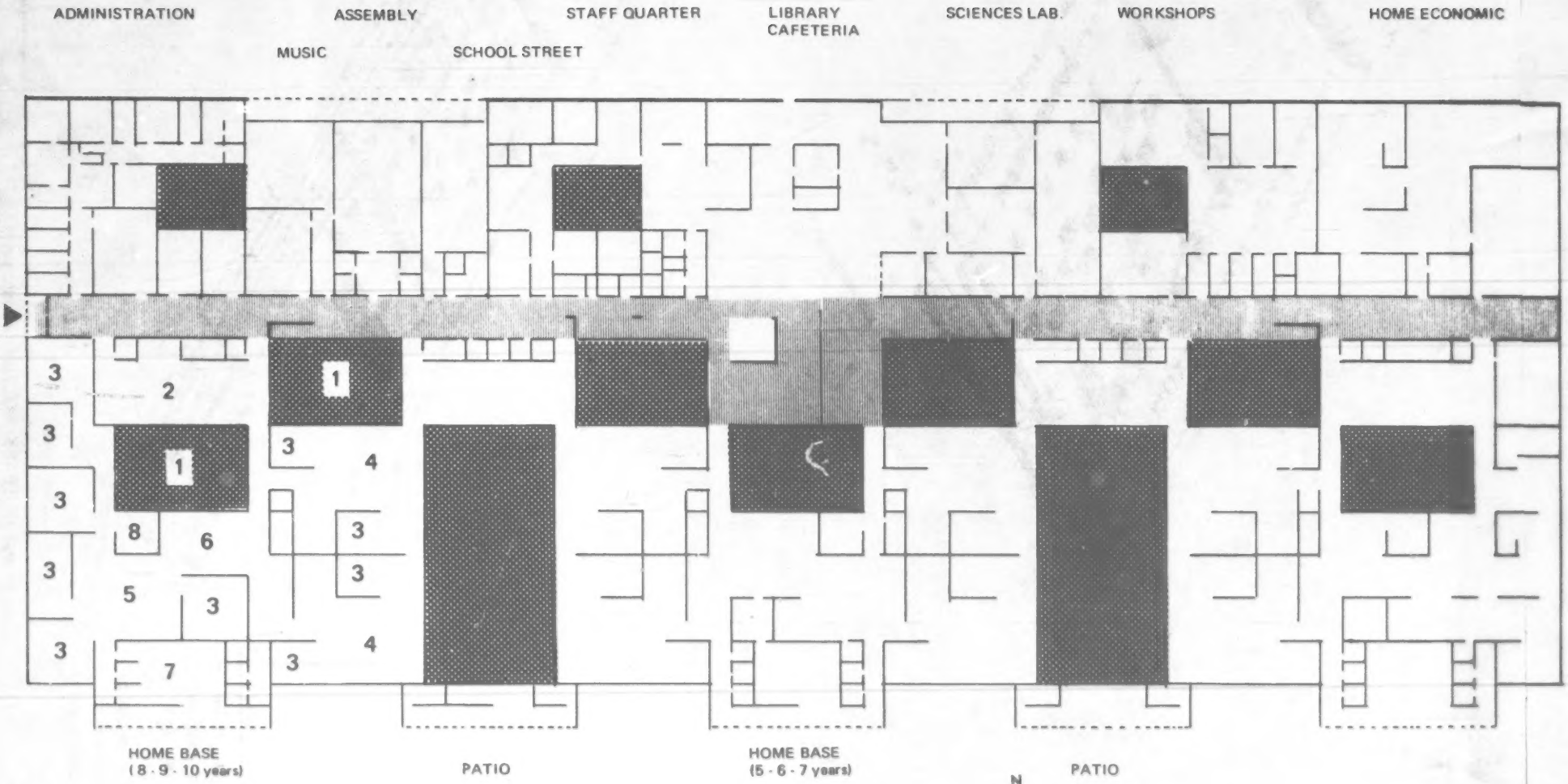
Tjørnelyskolen, Greve.

Stavnsholtskolen, Farum.

Stavnsholtskolen, Farum, DK.

Compact school designed in order to provide maximum protection against the main climatic condition : severe wind. All outdoor space has protective enclosures, by means of atic designs.

SCHOOL PLAN

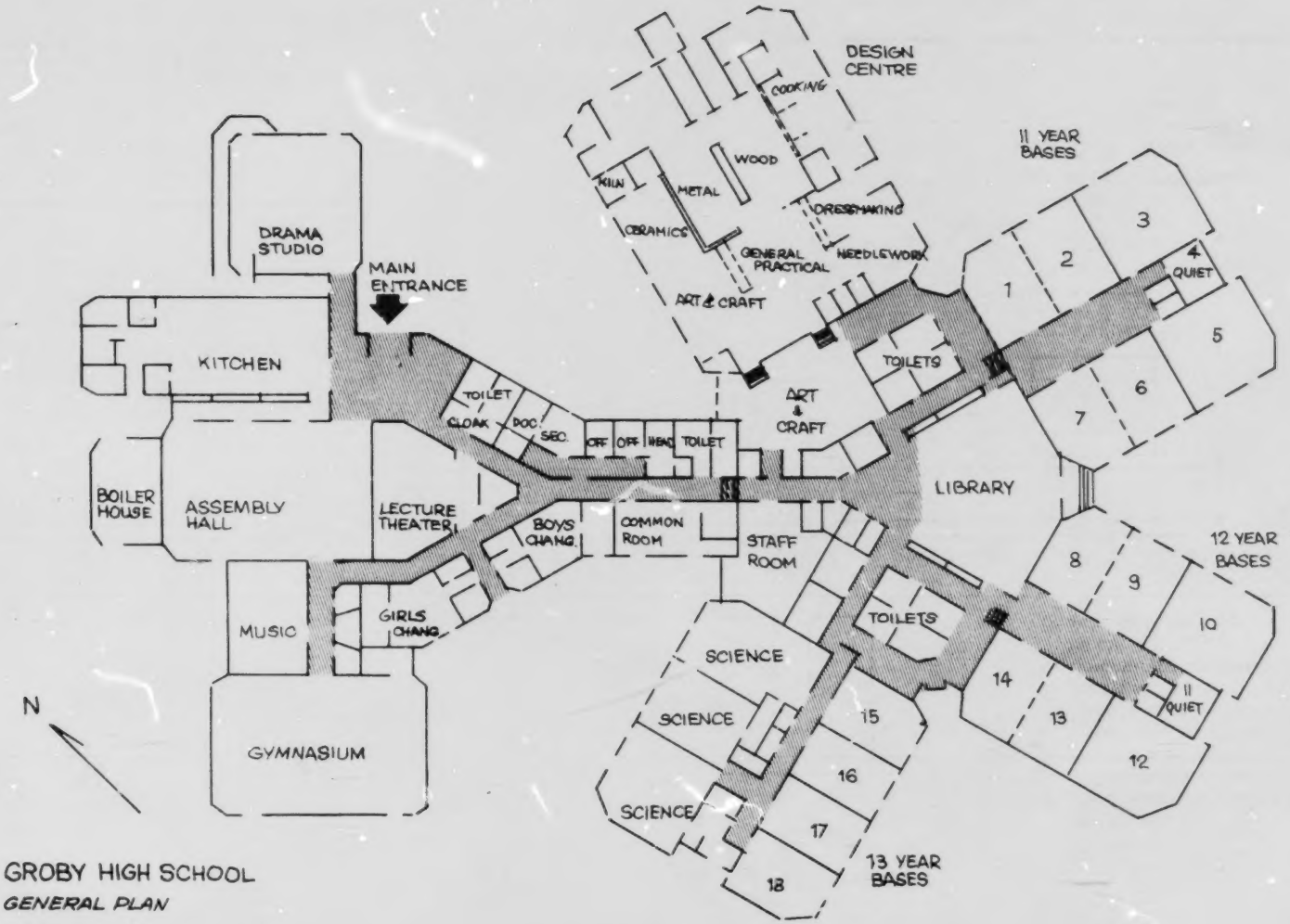


1. Patio
2. Pupil's Common Room
3. Classroom (blackboard teaching)
4. General Activities
5. Library (Home Base)
6. Practical Activities
7. Outdoor Activities
8. Staff Room

STAVNSHOLTSKOLEN
FARUM, Denmark
Architects: OLE PARK & OLSEN,
Copenhagen

PRIMARY SCHOOL
AND KINDERGARDEN

SCHOOL PLAN



GROBY HIGH SCHOOL

GENERAL PLAN

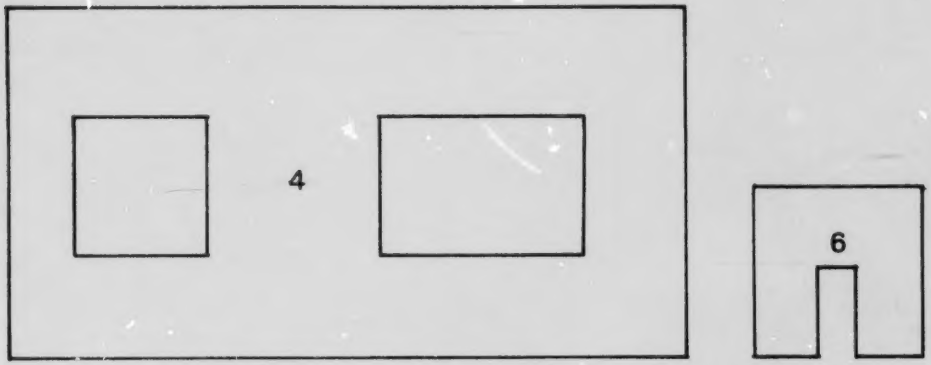
720 PUPILS

3330 sqm

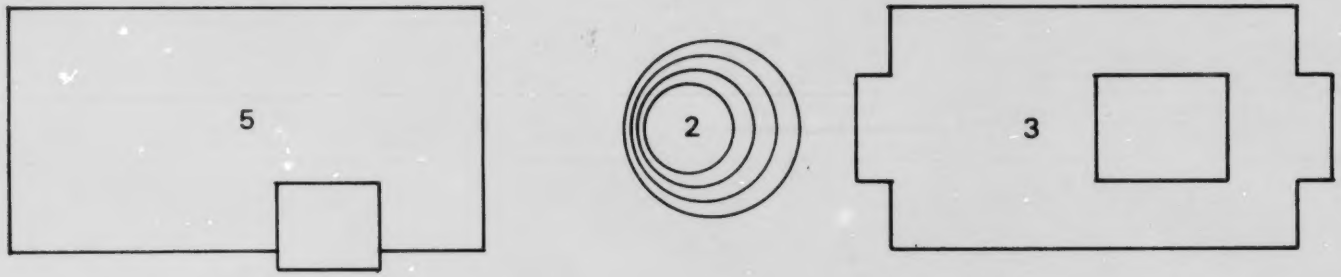
0 10 20 30 40 50 M

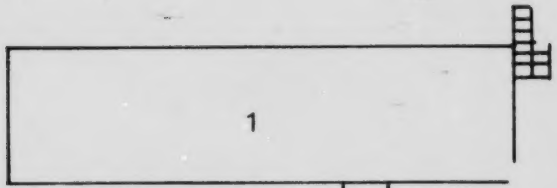
Architects: Leicestershire County Council, Architect's Department

SCHOOL PLAN



1. Parking lot
2. Main outdoor platform : children's playground
3. Primary School and Lower secondary block
4. Upper sscondary block
5. Sports and Community Services block
6. Administration block





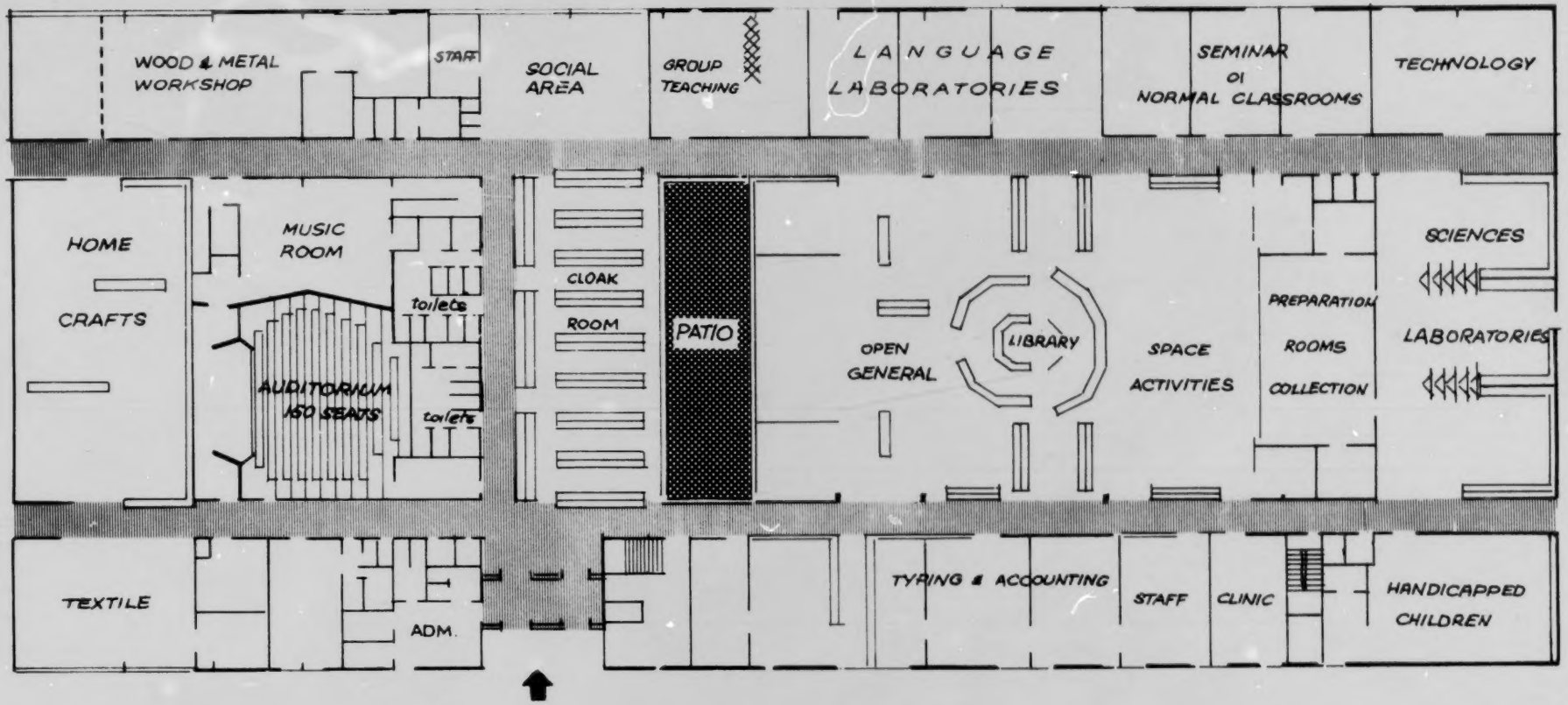
SITE PLAN

KROKSBACKSSKOLAN,
COMMUNITY SCHOOL,
MALMO,
SWEDEN

Architects: DAHL & STROMDAHL,
Malmö

ANNEX I page 11

SCHOOL PLAN
High School block

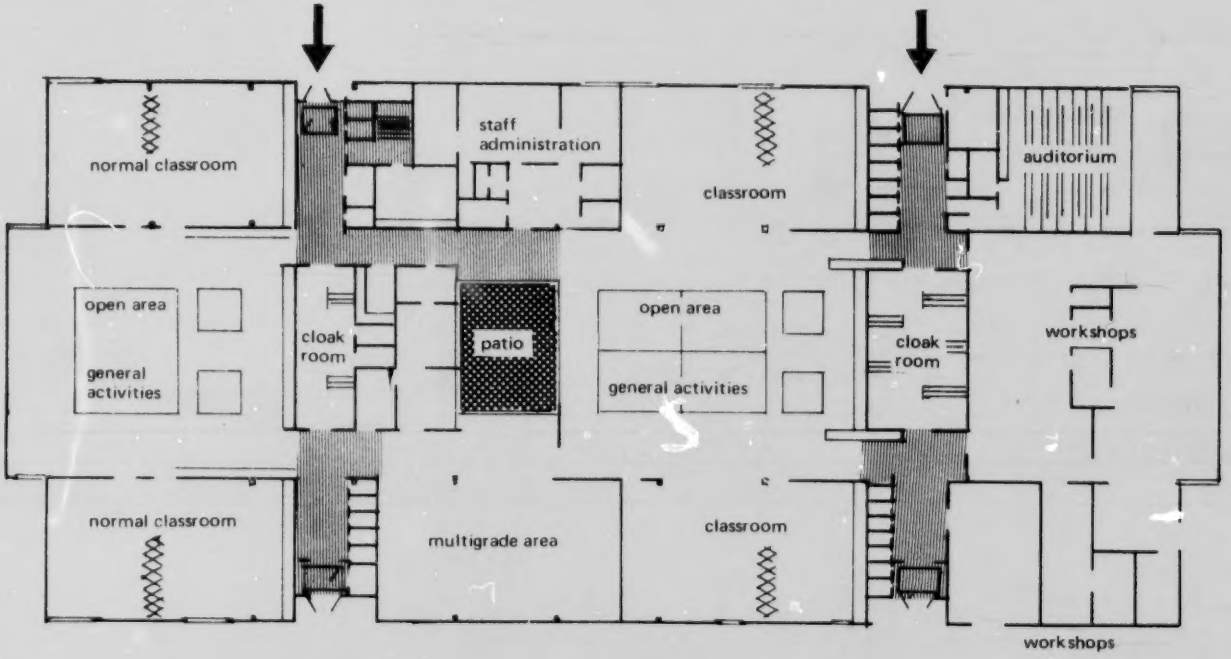


KROKSBACKSSKOLAN
MALMO - SWEDEN

10 20m
0 1 2 3 4 5 6 7 8 9 15

SCHOOL PLAN

Primary School and Lower secondary block



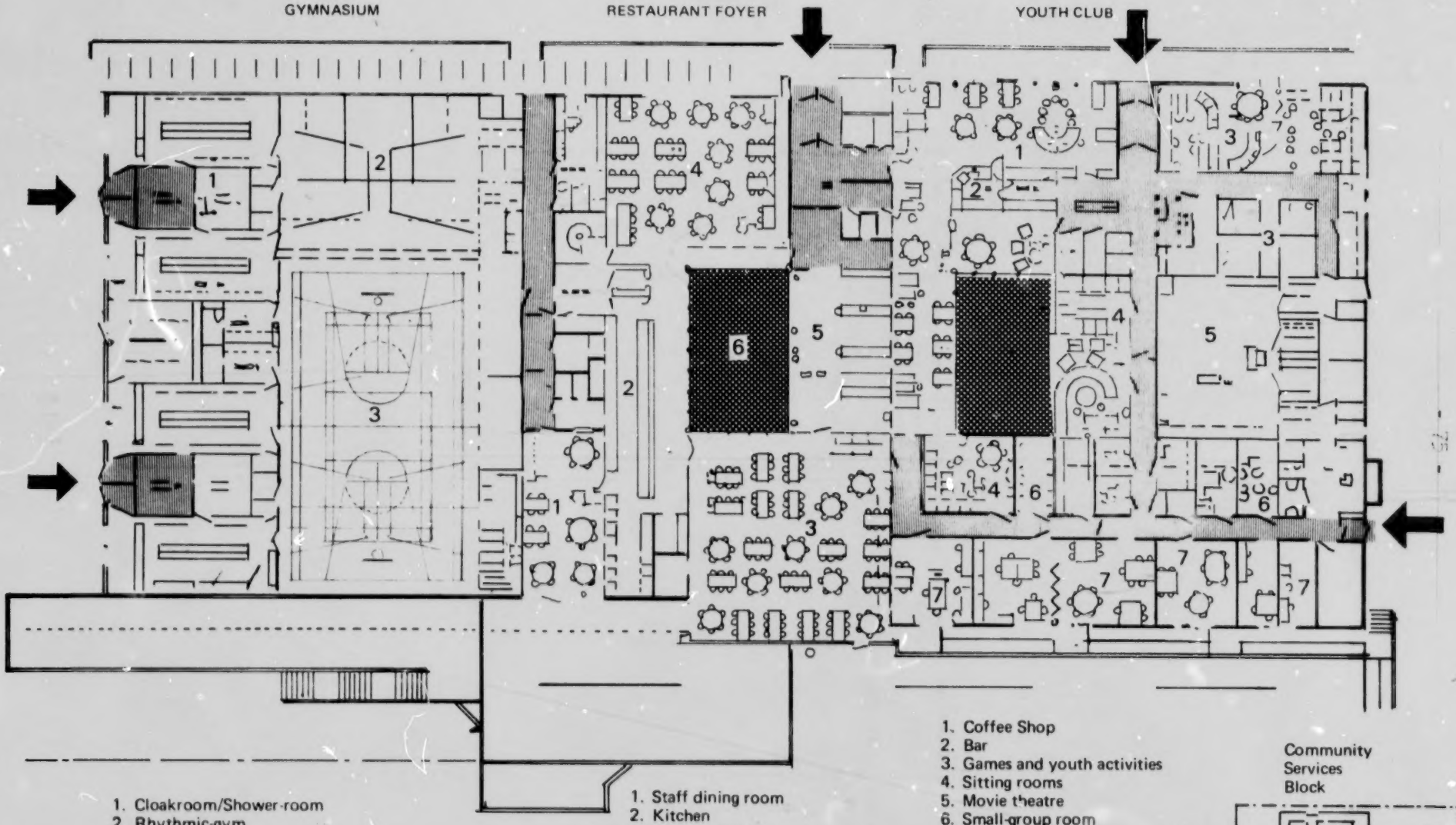
KROKSBACKSSKOLAN
MALMO - SWEDEN

1 5 10 15 20 m

SCHOOL PLAN

Sports & Community Services block

KROKSBACKSSKOLAN,
COMMUNITY SCHOOL,
MALMO,
SWEDEN



1. Cloakroom/Shower-room
2. Rhythmic-gym.
3. Sports Hall

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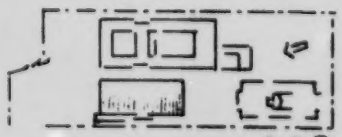
1. Staff dining room
2. Kitchen
3. Main dining hall
4. Additional dining hall
5. Cloakroom
6. Patio

1. Coffee Shop
2. Bar
3. Games and youth activities
4. Sitting rooms
5. Movie theatre
6. Small-group room
7. Workshops

Community
Services
Block



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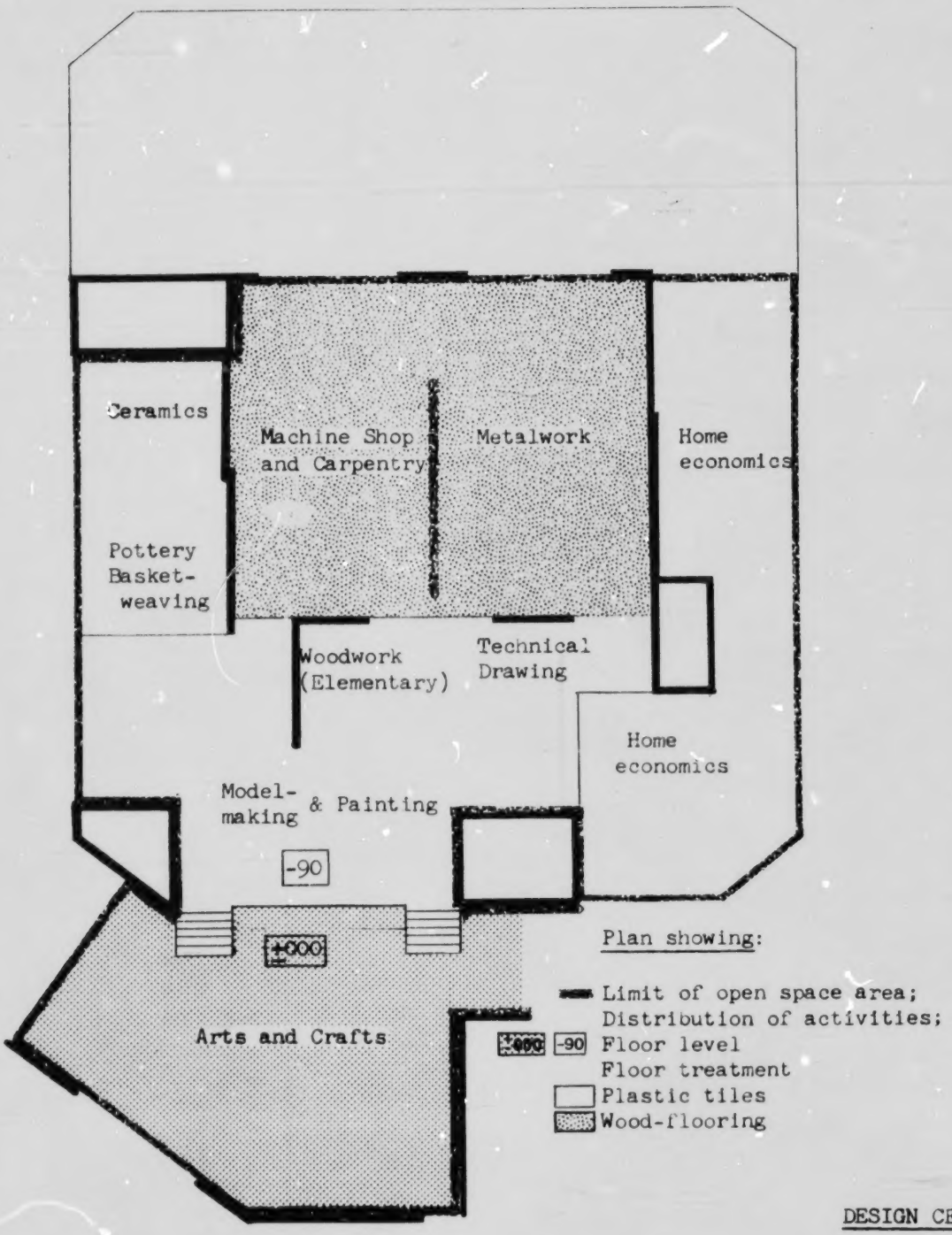
SAMPLE OF TECHNICAL DETAILS

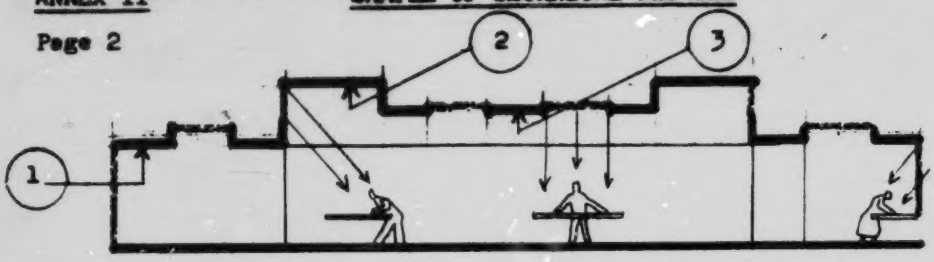


DESIGN CENTRE

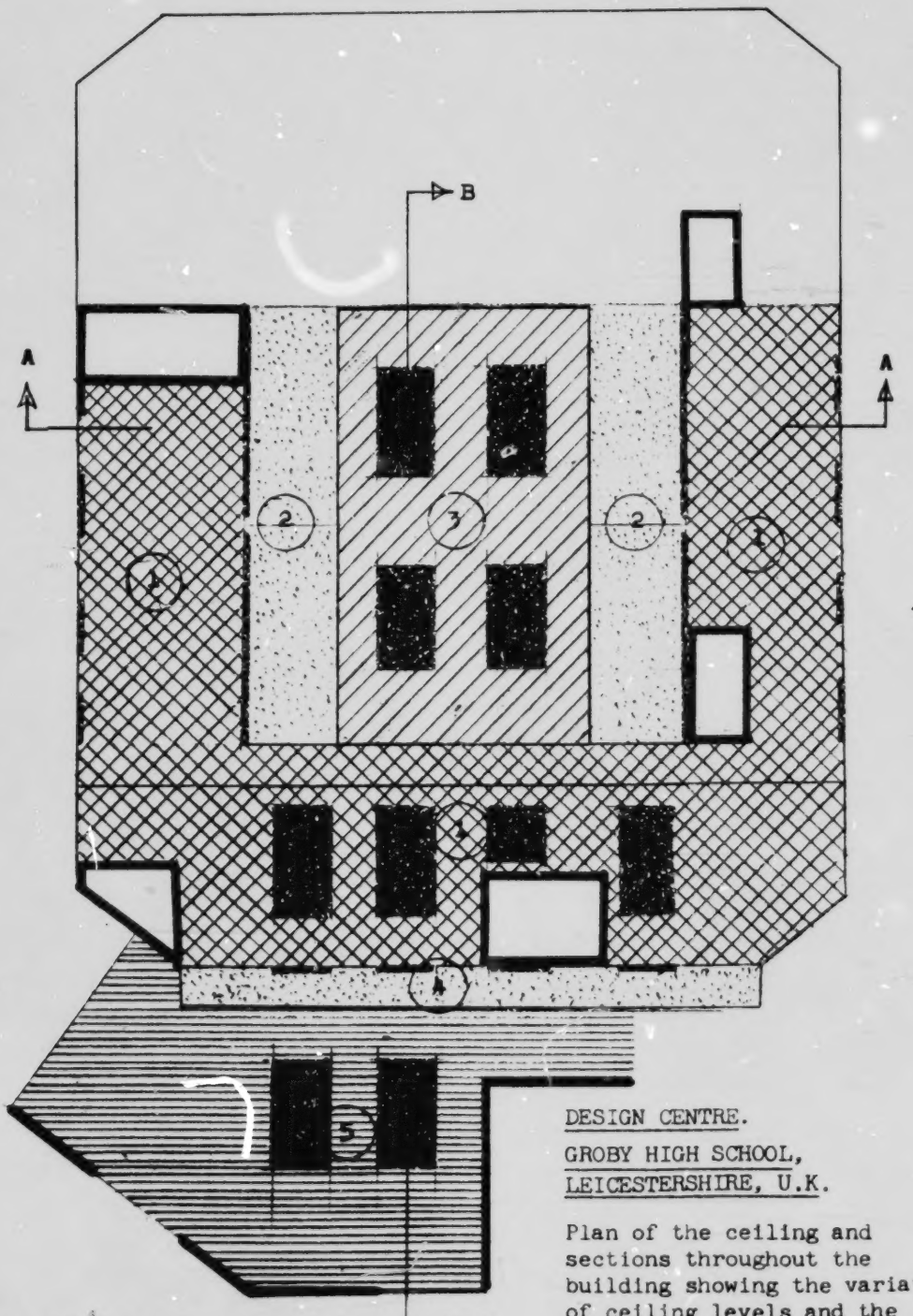
GROBY HIGH SCHOOL,
LEICESTERSHIRE,
U.K.

SCALE . 5 m/m p m

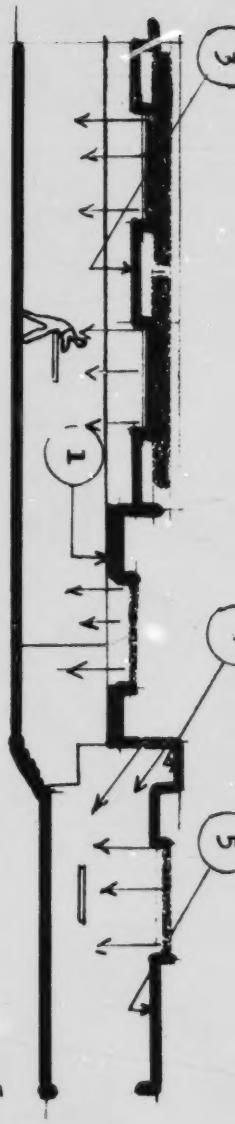
SAMPLE OF TECHNICAL DETAILS



Section A-A



Section B-B



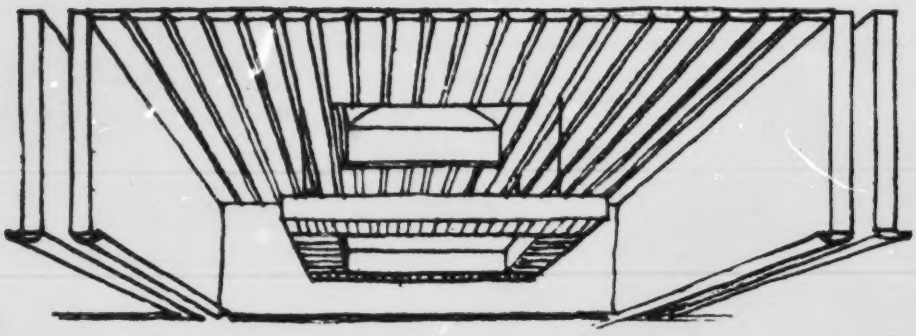
DESIGN CENTRE.

GROBY HIGH SCHOOL,
LEICESTERSHIRE, U.K.

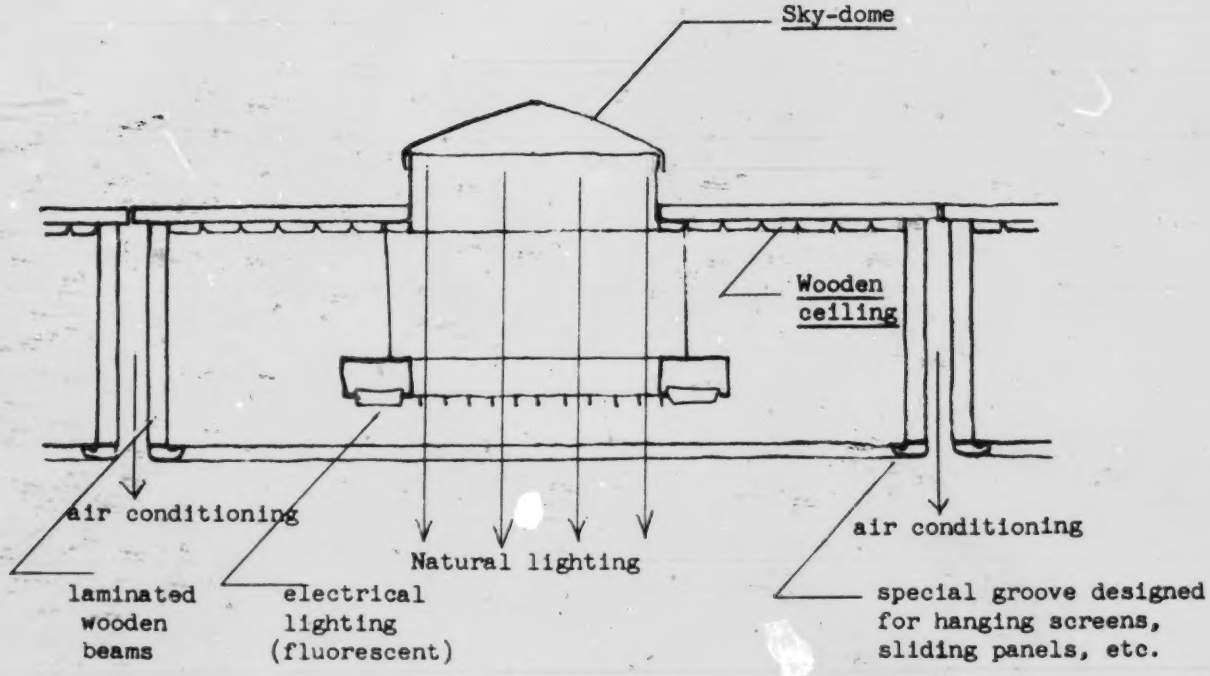
Plan of the ceiling and sections throughout the building showing the variation of ceiling levels and the distribution of natural lighting.

SCALE: 5 m pm

SAMPLE OF TECHNICAL DETAILS



View from underneath.



ROOF CONSTRUCTION

A TECHNOLOGY COMPONENT OF GENERAL EDUCATION

by

H.A. Foecke

A TECHNOLOGY COMPONENT OF GENERAL EDUCATION

Introduction

Unesco is convinced that any educational programme which intends to prepare all citizens for the world of today and tomorrow is seriously deficient if it fails to introduce them to the world of technology. This Unesco conviction is matched by explicit statements of a growing number of Member States. Furthermore, the widely-acclaimed report of the International Commission on the Development of Education, "Learning to Be", stressed the importance of this area in the following way:

> "One of the basic objectives of science teaching should be to underline the interdependence of knowledge and action. This concern should lead to dovetailing science teaching and the teaching of technology, to highlighting the relationship between research and the practical development and application. But just the opposite is happening today. Within the educational system generally, we are introducing a sharp separation between science and technology, a separation which is damaging to both. In general education, curricular are far too prone to make room for science rather than technology. By shearing it away from the practical side, a part of science is sterilized on the pretext of giving it greater prestige and, as a result, it loses much of its effectiveness as an educational tool. An understanding of technology is vital in the modern world, and must be part of everyone's basic education. In present day general education, technology is not treated in a systematic, conceptual fashion".

In a related section, the report returns to the same theme in a slightly different way:

> "As technology affects more and more people, compelling them to understand and master the technical world, so education in theoretical and practical technology becomes necessary to everyone. Rigid distinctions between different types of teaching - general, scientific, technical and professional - must be dropped. And education, as from primary and secondary levels, must become theoretical, technological, practical, and manual at the same time. If so-called general education is to become truly general, technological education must be developed".

As the reader may already realize, this is one area which is particularly plagued by problems of terminology; one encounters terms such as "general technical education", "technical and vocational education", etc. - all seemingly concerned in part with the same thing. On the other hand, when one has the time and patience to go beyond the semantic difficulties, one also finds genuine differences in objectives, content, and methods.

It is the purpose of this article to undertake a sufficiently broad analysis of this whole area so that the reader may understand better both the underlying ideas and the terminologies in which these are sometimes clothed. The paper will have four principal parts: (a) a section describing general human activities

relevant to the subject under discussion; (b) a brief examination of how one would educate students to prepare them for these activities; (c) a brief discussion of terminology; and (d) some indications of what a programme to develop "the technology component of general education" can mean.

II

Relevant Human Activities

Education may be viewed and defined in many ways; for purposes of this article, it may be said to be any deliberate attempt to help someone to engage in the various activities which are or will be a part of his life. There likewise are many ways of describing and classifying such human activities; taking a very broad view, we may say that, among other things, human beings seek to communicate (verbally, mathematically, and geographically), seek to understand the world of their experience (in the sense of knowing "why" things happen as they do, of being able to explain and predict), seek new and better ways of satisfying their needs (decide what is the best course of action when confronted with a choice), execute decisions that have been made (their own or those of others), create and appreciate works of art (in music, literature, sculpture, etc.), engage in recreation, etc. Of the foregoing incomplete list of human activities, three are particularly relevant to this discussion - "understanding-seeking", "decision-making", and "decision-executing". It will be useful to examine these individually in some detail.

Seeking to understand - to go beyond the facts to the reasons behind them (e.g., to know not only that solar eclipses occur but why) - is a very conspicuous and well-nigh universal type of human activity. People seek this understanding both for its own sake (we all possess to some degree a natural desire to understand) and for its usefulness (sometimes we need to understand in order to achieve some practical goal). If one wishes to increase one's understanding of some phenomenon (sunspots, photosynthesis, magnetism, etc.), the method or process employed depends upon the degree to which an explanation of the phenomenon is available. If an adequate explanation already exists, one would normally rely upon the body of knowledge already built up by previous investigators; if not, it is necessary to launch organized efforts to extend the frontiers of knowledge, to undertake a process which, if successful, will yield as a product which will be an addition to the pool of organized knowledge about observable phenomena. Some people - a small minority - make this pursuit of understanding, of cause and effect relationships, their principal life's work; needless to say, they usually receive special and extensive training in the methods or processes of searching for understanding. However, it is also argued that those who never (or only occasionally) undertake independent investigation should likewise have some direct experience with these methods and processes - in order to understand better their nature and limitations. There are special terms that are employed to designate these search processes, and their products, as well as those who engage in these activities in a major way, but for the moment it will be better to stay with the basic ideas and avoid terminology.

Before going on to the next type of human activity, there are two additional points which should be stressed. First, with reference to "understanding-seeking", man's curiosity is not limited to nature and natural phenomena (as the examples cited earlier might seem to imply); for some people, a colour television set can be as intriguing as a rainbow. Hence, there is both the world of nature as well as the man-made (or "man-modified") world to be understood. Thus, the "organized body of knowledge" mentioned above pertains not only to natural phenomena but it explains as well the characteristics, properties, and behaviour of man-made systems, devices, structures, processes, materials, etc. Furthermore, as with natural phenomena, anyone wishing to understand some man-made phenomenon can, in many cases, find that an explanation already exists. However, that is not always the case; throughout human history, man's ingenuity in finding ways to get jobs done (i.e. of solving problems) has frequently outdistanced human understanding of the underlying processes involved. Thus, the Romans built aqueducts without the knowledge of fluid mechanics which we now have, internal combustion engines were successfully used for decades before the processes of spark ignition were understood, electronic devices containing ionized gases were used before the properties of plasmas were understood, many drugs and medical practices (from aspirins to organ transplants) work for unknown reasons, and educators somehow succeed in promoting student learning in the absence of a lot that they would like to know about the psychological processes involved. These and other man-made phenomena which are inadequately understood also can be (and are) made the target of the same process of investigation described earlier. So, for both natural and man-made phenomena, both the process and the products of investigation are of essentially the same type.

The second area of human activity mentioned at the outset, "decision-making", refers to another very prevalent characteristic of man, namely, his constant effort to find new and better ways of achieving his goals, of doing a job he wants done, or of satisfying his needs (for transportation, nutrition, communication, energy conversion and distribution, production, recreation, shelter, etc.); this activity might also be called in some instances "problem-solving". In the example mentioned above, it was stated that someone who wanted to understand something might try to determine whether an explanation already exists. In a comparable manner, an individual faced with a problem to solve might try to find out whether anyone else has already solved a problem that was essentially the same, whether there already exists some device, process, material, technique, etc. which can be used or adapted. To give only one example, if the problem is one of transporting men and materials across a river, there already exist many "prototype" solutions - transport by air, by various conveyances (train, truck, animal, etc.) traveling over any of several types of bridges (truss, suspension, etc.), by floating conveyances, by tunnel, etc. Whichever solution would be chosen would depend upon the many particulars surrounding this specific problem - width and depth of the river; kind, amount, and variability of the things to be transported; costs, safety, maybe local laws and/or customs, maybe aesthetic considerations, etc.

In any event, if the solution is patterned after an existing one, no creativity is involved. However, sometimes a "problem-solver" will come up with something essentially new - either because no adequate prototype solution (technique, device, material, etc.) exists or simply because he happened to think of a much better solution. Thus, in trying to solve practical problems, someone was the first to conceive of a triode amplifier, a free-piston engine, pre-stressed concrete, a heat-resistant plastic, a process for manufacturing sulfuric acid, etc., etc. Thus,

the process of trying to solve a real and practical problem sometimes produces a product which, having demonstrated its usefulness, joins the huge reservoir of proven techniques, devices, materials, etc., a reservoir of prototype solutions upon which future problem-solvers can draw as needed.

Just as there are individuals who devote their professional lives to searching for understanding, so too there are those whose careers are devoted to finding solutions to problems in their respective specialized fields of activity (technical, medical, legal, managerial, educational, etc.), and such individuals likewise usually receive extensive training in the processes, decision-making or problem-solving pertinent to their fields. When it comes to the "man in the street", whose livelihood does not depend upon his ability to solve complex problems, it could be argued (as it was for the activity of seeking understanding) that he too should have direct experience with the process of problem-solving or decision-making. Indeed, the argument would seem to be many times stronger for learning this second process because, whereas few ordinary citizens ever undertake independent investigation of observable phenomena, almost everyone is involved in his day-to-day life in making decisions and solving problems. What is more, this involvement of one and all in frequent decision-making will be increasingly the case in a world characterized by change, where people will be confronted with new situations and problems and will have to be prepared to cope with these.

At this point it would be beneficial to note the contrasts between the processes of understanding-seeking and decision-making (or problem-solving). The first results from a desire "to know", the second from a desire "to do"; the first is related to the second as analysis is to synthesis. The first proceeds from the particular to the general (trying to relate individual phenomena through ever broader relationships); the second moves in the opposite direction (bringing general principles to bear on specific problems). The two processes answer entirely different kinds of questions - the first answers "what is?" (is there a relationship between smoking and lung cancer, what is the effect of various nutrients on plant growth, can concepts of set theory be learned by typical eight-year-old children); the second process answers "what should be?" (given my age, my health, and my psychological make-up, should I smoke and, if so, what and how much; considering cost, availability, and all other factors, what fertilizer should I use on these crops this year; considering their previous education, their needs, and the other things they might learn, should I teach set theory to these eight-year-old children). So, although there are some parallels between these first two areas of human activity, the most important point is that they are fundamentally different.

Proceeding now to the human activity of "decision-executing", and relating it to the activity of "decision-making", it will be recalled that the latter involved selecting, from a large reservoir of "solutions" (techniques, devices, materials, processes, etc.) which have proven their usefulness in achieving various tasks, those which are most appro riate for getting the job done. Within this reservoir are an enormous number of methods and techniques which directly involve human beings in some way in their execution. Thus, if a doctor decides to remove the appendix of a patient, the carrying out of this decision involves many kinds of human skills and techniques - the skill of the surgeon himself, the skill of the anaesthetist, the skills of the nurse in administering injections, making blood tests, dressing wounds, etc. The decision to build a bridge according to some

detailed design might easily involve hundreds of essentially different human skills and techniques. There are in industry, in construction, in agriculture, in education, etc. many such examples - involving relatively few decision-makers in relation to the number of decision-executors. Consequently a large fraction of the human race is derived from the skillful performance of special skills and techniques. However, there is another category of examples. As with the other two types of human activity, decision-executing is also relevant for the ordinary citizen. It has already been stated that the man in the street makes many decisions on a day-to-day basis. Clearly he also executes a large fraction of these decisions, and such action would normally involve skills which may be simple or complex. Depending upon his culture and circumstances this may range from hunting game for food to driving an automobile in dense urban traffic, from chopping wood to dialing a trans-oceanic telephone call, from igniting a fire by friction between twigs to operating a micro-wave oven. Whatever one's circumstances, there are a host of skills and techniques which the ordinary citizen must master if he or she is to live effectively in his surroundings.

Although the foregoing examples have suggested primarily manual skills, there is no shortage of examples involving other types, e.g., analytical and computational skills. However, it should be noted that, regardless of whether the skill is manual or intellectual (or a blend of both), in general it involves following standard or prescribed procedures; there is a "right" way and the quality of the results can be judged by relatively objective standards. This is in contrast with the decision-making process which has a "right" result only in relation to goals and values; the process and solution must take account of such intangible and value-related items as safety and aesthetics, or may require compromises between incompatible objectives (economy, accuracy, reliability, etc., the relative importance of each again being a matter of value).

Before leaving this subject of decision executing, it should be noted that there may or may not exist an understanding of why the techniques or skills accomplish what they do; as already pointed out, human history is full of examples of things which have been developed and which work for reasons that are poorly understood. In any event, when the underlying phenomena can be understood, it does not necessarily have a direct and significant effect upon the performance of the skill itself (e.g., the difference in the skills of two automobile drivers will not depend heavily upon their knowledge of internal combustion engines, automatic transmissions, power brakes, etc.).

III

Educational Preparation for These Activities

Thus far, three areas of human activity have been described without employing most of the terms which might lead to semantic difficulties. This avoidance of terminology will be continued in this section, which will consider briefly the educational questions involved in preparing students for these human activities. First of all, with respect to "understanding-seeking", there is both the process

and the product which can be learned. If it is felt (as it currently is) that the student should understand the process of searching for explanations of natural and man-made phenomena, then it must be recognized that it can hardly be learned by reading or listening to lectures about it; it is perhaps only learned through practice, and best learned through supervised direct experience.

Regarding the product of the search process, i.e., the organized body of knowledge which explain phenomena, again it is best to have direct experience with the phenomena where possible; why learn about plant growth exclusively from books when one can observe it? However, one should note that this direct experience, important and irreplacable as it is, is not the equivalent of learning the process of investigation. The experience with phenomena can justifiably be (and frequently is) essentially a form of "demonstration" (even if performed by the student) in which various principles or laws are illustrated by following steps which are more or less carefully spelled out.

In thinking about helping students learn about the products of the investigative process, one should not forget the organized body of knowledge about the man-made world. As with understanding natural phenomena, this can come about in various ways, including especially direct experience; it is possible and desirable for students to make observations and measurements on man-made devices and materials (heat exchangers, gear boxes, electrical filters, etc.) in order to verify their characteristics and properties. In fact, it is through an analysis and understanding of complex man-made systems that students can marvel at the creativity of the human intellect - as they can, when studying natural phenomena, delight in the regularity, complexity, and beauty of nature.

Turning to the process of decision-making, and to its occasional product in the form of a contribution to the reservoir of useful techniques, materials, and devices, the process is again best learned only through direct experience, preferably under supervision. Consequently, students can, at various age levels, be confronted with "realistic" (and, ideally, real-life) problems to solve. In attempting to do so, the student can easily be made to see that the skill of the problem-solver depends, in part, both upon his understanding of the relevant underlying phenomena and upon his acquaintance with the reservoir of potentially applicable techniques, devices, etc. As to learning about the contents of this reservoir, it should be noted that the problem-solver need not himself be a master of all of the techniques which might be involved in the execution of his decision (if his solution requires the production of certain metal objects by means of the skilled use of a lathe, it is enough for him to know what can be done; the execution of the plan can depend upon the skills of a lathe operator), nor need he understand the theory underlying devices which might be employed (it suffices that he know whether an oscilloscope can make certain required measurements; he need not understand the behaviour of all of the electronic circuitry involved), etc.

There is at least one important difference between helping students understand the products of the two processes of understanding-seeking and problem-solving. In the first case, one is dealing with an organized body of knowledge; it fits together, links exist, and the various parts, when learned, reinforce each other. This is not true for the second case; the kind of factual information which a problem-solver needs about what various devices and techniques will or will not do is intrinsically "non-organized" knowledge (unless of course one goes beyond that which is needed by the problem-solver, i.e., proceeds to seek an understanding of the underlying theory).

Finally, in trying to help students prepare for the activity of decision-executing, one is involved essentially in promoting the learning of techniques and methods, i.e. of skills. These in particular are learned by doing, through practice. The learning of the complex skills associated with many modern processes is frequently achieved through school programmes. For the host of skills needed by the ordinary citizen as a part of his daily life, many of these are learned outside formal education, but some of the more complex ones are gradually being included in educational programmes.

Considering the education associated with preparing students for these three areas of human activity, it appears that links could be made between them. First of all, the learning of decision-making and decision-executing can, with proper planning and selection, be woven together; if the students have been given a real-life problem to solve, after they have decided what should be done, they can be asked to implement it - gaining practice in, as well as an awareness of the importance of the skills involved. Secondly, a link might sometimes be made with the process of understanding-seeking but it would be less easy and not always possible. The link could come through the fact that the problem-solver may need to understand certain phenomena in order to achieve a good solution. Hence, a project to solve some practical problem could lead to a related project to investigate (and learn more about) the phenomena involved.

IV

Possible Meanings of Terms

If these areas of human activity have been successfully described in relatively ordinary language, it should now be possible to relate any particular set of terms to all or part of what has preceded. As a preparation for the concluding section of this article, it is now convenient to introduce some of the customary terminology.

Accordingly, first of all, with reference to the human search for an understanding of the world of our experience, in this article the process will be called "research" and the resulting organized body of knowledge "science". The research process involves the application of the so-called "scientific method" to the particular phenomena involved (biological, astronomical, chemical, anthropological, geological, etc.), but that additional compound term is not too helpful because one finds in the literature so many versions of the scientific method. An overall research effort will frequently involve a number of subordinate processes - data collection, classification, etc. These subordinate processes are sometimes called "research", but such a meaning is excluded here. Similarly, the term research is sometimes used very broadly to include problem-solving activity; such a meaning is also excluded here because, as was argued earlier in this article, the process of research and problem-solving seem fundamentally different.

It was pointed out earlier that both natural and man-made phenomena could be the target of investigative efforts. To the extent that distinctions are necessary, "basic research" (or "fundamental research") will be used herein for investigation of natural phenomena and "applied research" for man-made phenomena (note that applied research is still different from problem-solving). The organized

bodies of knowledge built up by these research processes are the "natural sciences" (physics, astronomy, hydrology, chemistry, etc.) and the "applied sciences" (engineering science, medical science, educational science, management science, agricultural science, etc.). It should be noted that the various applied sciences are very important in solving corresponding types of problems but should not be confused with the activity of the problem-solver; engineering science is not the same as the practice of engineering, medical science is not the same as the practice of medicine, etc.

Turning now to the area which up to this point has been called problem-solving, there is no single widely accepted word that designates the process involved. One common and widely used term not introduced thus far is "design"; this fits many situations, but not all. As already explained above, the design (or problem-solving) process usually draws upon the existing reservoir of proven techniques, devices, processes, materials, etc., a reservoir which is built up by those instances in which the design process involves creativity and leads to an essentially new solution. In this paper, the word "technology" designates this reservoir. Finally, as already noted, the skills and techniques that can be learned by human beings are a part of this reservoir of technology.

Summarizing the above, science is the organized body of knowledge which attempts to explain phenomena (natural and man-made), the product of a process of research, a process which springs from a natural human desire and/or need to know; technology is the reservoir of techniques, materials, devices, etc. which have demonstrated their usefulness in achieving various tasks, the reservoir being built up through creative instances of the process of design (or problem-solving), a process which flows from man's natural desire to improve his circumstances, to find new or better ways of satisfying his needs.

It may be asked why, if the focus of this article is the technology component of general education, so much space has been devoted to activities which are labelled "science" or "research". The answer lies in the varied use of terminology in this area. Thus, for example, in some instances a study of the characteristics and behaviour of man-made devices is called "technology" but would be labelled "applied science" according to the use herein. By contrast, some of the topics which are treated in "science" courses deal in fact with technology as defined above. Yet again, the processes of research and creative design are very frequently confused, the former term unfortunately being used to denote both.

V

A Technology Component of General Education

This concluding section will give a few general indications of the possible directions of a Unesco programme to develop the technology component of general education. First of all, a learning experience will be considered a part of "general education" not on the basis of whether or not it is required of all students but rather on whether or not it is designed primarily to contribute to the development of any individual as a person (i.e. his growth and enrichment just as a human

being, apart from particularities of nationality, sex, race, occupation, etc.) and/or as a citizen (i.e. those additional things which an individual needs to cope with life in his community and to participate fully in the general responsibilities of citizenship in his particular country). This therefore excludes courses which are intended primarily to assist in the development of the individual as a special contributor to society through a particular occupation or vocation; courses of this latter type are much needed also, but they would be a part of another and related programme.

Consequently, a programme to develop a technology component of general education would involve the introduction into formal educational programmes at various levels, of experiences with the processes of decision-making and decision-executing, experiences so designed as to be of general benefit to the student as a person and as a citizen, apart from whatever his future area of specialization might be. Furthermore, it would be assumed that under the general heading of science, the student would also be developing an understanding of the body of knowledge concerning phenomena of the man-made world, i.e. of applied science. Indeed, it seems desirable to link science education and technology education as closely as possible, especially, at the beginning school levels, as clearly demanded by one of the portions of "Learning to Be" quoted in the introduction to this article.

If one examines what is implied above in relation to what already exists in Member States, it would seem that the most unique part of the proposed programme would be the deliberate exposure of the student to the decision-making (or problem-solving) process. It is sincerely believed that this is a sadly neglected area of education, an area which would be of direct and major value to all citizens, and that this deficiency can be remedied by an appropriately designed technology component of general education.

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TOWARDS AN INTEGRATED PROGRAMME OF SCIENCE AND TECHNOLOGY IN INTERMEDIATE AND SECONDARY SCHOOLS

by

R. Harris and R. Aujame

TOWARDS AN INTEGRATED PROGRAMME OF SCIENCE AND TECHNOLOGY IN INTERMEDIATE AND SECONDARY SCHOOLS

Introduction

A growing realization of an underlying unity in seemingly diverse subjects, coupled with a movement towards more heuristic learning, have brought about a reaction against rigid subject teaching and a tendency towards what is termed "integrated teaching". In such circumstances, it is understandable that the twin subjects of science and technology should be considered ready-made for this new approach. Without becoming involved in a discussion on what constitutes integrated teaching, a study of this integrated approach, for science and technology, is pertinent, not merely because of the present fashion, but much more so because these two subjects form an increasingly important part of the curriculum in secondary schools.

In fact, a curriculum which does not include a sufficient proportion of work in science particularly, and increasingly so in technology, is in danger of being described as irrelevant, unadapted to the needs of the country, academically oriented, unable to provide relevant opportunities or simply lacking the two main pillars on which a modern society can be built, depending upon the verbosity of the commentators at the time. Without care, one could almost be led to believe that, if science and technology do not provide the panacea for the ills of the world then, at the very least, they do for the ills of education. But, it is necessary to see these trends in perspective, so as to form a clear idea of the different ways in which science and technology can become a part of the secondary school curriculum and, in doing so, what can be expected of their inclusion. This paper discusses one such approach, then makes some suggestions as to how this can be carried out. In order to do this, it is necessary to discuss why science and technology should be considered ready-made for integration. But, the question why always presupposes two parts, the mechanistic, i.e., what events have led up to the present situation and the teleological, i.e., what is the purpose behind the considered integration.

Events Leading up to Integration

From the moment when primitive man made his first technological innovations by fashioning and using tools and weapons, his progress and rate of evolution has been greatly influenced by technology. Technology was then, and remained so up to the middle of the 19th Century, simply the application of discovery or invention to practical ends. Down the ages, by means of technology, man has changed his environment and continues to do so to an increasing extent. After all, altering one's environment by developing agriculture and the domestication of animals must have been a risky thing to do in the light of knowledge then available.

Early man learned how to obtain metal from ores, to tan leather, to make soap and to produce glass and, through many centuries of human history, practical knowledge and experience were gradually accumulated. Great practical progress was made long before scientists were able to explain the reasons for, and the success of, the new procedures. For example, in the 18th Century, improvements were made in the manufacture of iron and steel before chemists had found out the real difference between cast-iron, wrought-iron and steel. And other revolutionary advances in industry, at this time, were but little influenced by the progress of science. On the other hand, it is probable that, under the influence of the inventors of the period, the spirit of scientific experimentation was intensified.

However, the pace of change prior to the 19th Century was, in general, tolerable because it rarely involved revolutionary social or occupational changes during the span of one lifetime. A more rapid change was begun in the latter half of the 18th Century and, as before, was due to the exploitation of chance discovery and invention. But, it was not until around the middle of the 19th Century that there came into being what is now known as technology - science and the results of scientific research applied to the solution of practical problems. Its birth was due to a brilliant series of scientific discoveries, coupled with a realization of their practical possibilities. Men of science then began deliberately to apply their skills and the results of research to the solution of industrial problems. In fact, the electrical and chemical industries can hardly be imagined if there had been no previous advance in science.

Up to this time, science and technology had each followed what seemed at times to be parallel, but more often than not, divergent ways. But from this point onwards, their ways began to converge, giving rise to almost simultaneous scientific discovery and technological application. In fact, the progress of science and the progress of technology are so closely linked in a complicated net of interrelationships that there is a danger of confusion between these two lines of development. However, science is concerned with conceptual schemes and the checking of deductions arising from them, while technology seeks the improvement of techniques, instruments and machines, i.e., the practical solution of practical problems. And, even though much scientific research depends upon technological skill, and technological development depends upon scientific research, they are different disciplines and the aims of each are separate and distinct.

Purpose behind Integration

From the growing realization of the interrelationships of human activity, rigid subject barriers are considered as artificial, and there is a general trend towards "integrated teaching". For example, languages and mathematics, in some instances, are being taught together, so as to try and show that mathematical processes are not confined to the traditional style concepts. Moreover, life in a modern society requires from its members universality and adaptability, a

flexible rather than a rigid approach to life and its problems while paradoxically, at the same time, demanding more and more specialized knowledge. And, although all forms of education are now being seen as part of the preparation for a job, it is unlikely to be one of lifelong duration, since different occupational roles are continually emerging. More and more, there is a need to develop, not only a preparedness to change jobs, but also to undertake further training so as to keep abreast of developments.

A point in time then has been reached at which scientific knowledge and technological development are not only inextricably interwoven, but also to an ever-increasing extent profoundly influence the environment and people's lives. This influence can be seen everywhere. In fact, the technical-industrial-scientific civilization is, within man's knowledge, the one which has come nearer to being worldwide than any which has existed previously, and it is continually expanding. Not only from the standpoint that more and more countries are, even if slowly, beginning to industrialize, but also that the products of industry find their way into and use in remote areas of the world. In such circumstances, it is realized that some knowledge and understanding of these forces which are shaping human society are essential for everyone, regardless of the kind of job they perform. And, it has become generally accepted that the purposes and aims outlined above require a broad and integrated educational base from which to develop.

The Dilemma

Quite clearly, for education the mechanistic and teleological views point in different directions and it is necessary to try and find a way which will combine the best of both. Even so, given the present educational climate it is inevitable that the latter view should be having the greater influence and, more and more, integrated teaching should be envisaged.

This can be seen clearly by an examination of a "modern" as distinct from a "traditional" secondary school curriculum. The latter would specify subjects, mathematics, history, science, etc., together with the details to be learned in each subject and, in all probability, the whole aimed towards an examination. On the other hand, a "modern" curriculum would most likely consist of topics, e.g., man the explorer; study of the individual and the group, etc. Clearly, such studies not only cut clean across subject lines, but they also lack any definition of precise objectives. It is not the intention of this paper to consider these differences in general, but simply in relation to science and technology and their study in secondary schools.

For many centuries, education was concerned with the learning and teaching of a fairly well defined body of knowledge and the kind of knowledge which was being imparted helped to form the system. But, the scientific and technological process, it is not an event, has forced, and is still forcing, the education system to the dissemination of new knowledge and the teaching of new skills to an increasing number of people. In an attempt to make the system suitable for these new conditions,

scientific and technological education was added on and, in the main, subjected to the established pattern of learning/teaching to which, in part, they are unsuited. On the other hand, since science and technology have precise, separate and distinct aims, the teaching/learning of them, through a wholly integrated curriculum, is equally inadequate.

Learning and Experience

Science consists of both the empirical and theoretical approach with theory taking over an increasing role, whereas technology is empirical and is likely to remain so, however much advances in science may influence its progress.

Quite clearly, while the training and methods of work in science and technology will have **similarities**, the progress which has been made has come about from an increased partnership of two different types of related human activity. It is then from this standpoint that the treatment of these two areas of study in the secondary school curriculum can be considered.

In each case, learning is only a part of the educative process for these disciplines. The students should be exposed, to the greatest possible extent, to the essential element of meaningful experience. For example, one can learn that precise reactions will occur from particular chemicals under specific conditions. Similarly, one can learn a technological process on how to form precisely a piece of metal by the use of certain tools and machines, but this in itself is insufficient. In each case, it is necessary for the learners to experience, i.e., themselves perform, as far as possible, the actual experiement/process. It is this essential experience requiring, in various degrees, a disciplined co-ordination of observation and physical skills which marks out science and technology from other studies. Other areas of study can also profit from the element of relevant experience, but by their nature, it is less precise and direct.

The actual performance of processes in science and technology involves a disciplined concentration on detail because of the increasingly fine limits of error which can be allowed, without totally negating the particular experience. The increasing degree of control which the student will find necessary as he progresses through this work is an essential element of his experience. In addition, many of the tools and processes used are potentially dangerous if not handled correctly, so a strict observance of safety regulations is essential.

In this "learner experiencing" situation, science and technology themselves exhibit differences. In science, there is need for acute observation, the accurate recording of results,1/ careful checking with the particular theory in question or

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1/ A good scientist never makes the results fit the theory; something new may emerge from differences.

deviation from the normal reaction, precise tabulation of method and drawing of conclusions; apparatus used will be assembled for a particular experiment and probably dismantled afterwards. Whereas technology will require not only practical investigation into a variety of machines, instruments and mechanisms in order to find out how problems have been overcome, but also the precise transformation of materials into different shapes and forms for specific purposes. In the case of science, the student is verifying in the simplest way, with a minimum of equipment, in technology, he is finding out from equipment which is already in practical use, and also producing a purposeful material object, the precise nature of which he will have first represented, according to certain rules, by drawing and from which he will produce the tangible object.

In the traditional system, experience was generally left to be gathered, as best it could be, after the process of education had been completed, and the attempts which have been made to expose students to some scientific and technological experiences have suffered, more in the case of technology than science, from limited time and scope. On the other hand, the integrated approach attempting to include experience as a part of the total educative process, can be too superficial because it lacks definition and a coherent pattern.1/ It is most likely that one will know something about science and technology rather than having real knowledge and experience of them.

Apart from all this, there are also two practical difficulties to be overcome when science and technology are to be included in the curriculum. The first one is the question of time, at the expense of what other studies will they be included? And secondly, arising from their inclusion, will the necessary finance be available to cover the increased capital and recurrent costs? A danger being that a decision will be made for the inclusion of science and technology, but the necessary funds for satisfactory operation will not be available.

The inclusion of a technology component in secondary education presents more problems than the inclusion of science. In many cases, science is already a well-established part of the curriculum, technology still has to make its way. Science being and becoming increasingly more theoretical can be more satisfactorily dealt with by the established pattern of teaching/learning. Experimentation in science can be more easily, and often is, at a level quantitatively and qualitatively below the barest necessary minimum. Technology being empirical is meaningless without practical work. Science, becoming more and more a cultural pursuit, is not only more socially acceptable but it also fits easily into the existing examination pattern. Often, examinations in science do not call for the performance of even the simplest experiments, while the evaluation of technology is practicality. This places on the education system the problem of devising some means for "examinations" in

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1/ It could lead to academic insecurity.

technology which can be related to the existing system. This problem is often shelved by making technology optional and/or a non-examination subject, with the consequent lack of serious interest in it.

Quite clearly, if a meaningful technology component is to be considered for inclusion in the secondary school curriculum, then a way has to be found which is able to overcome the difficulties mentioned above. It is suggested that a co-ordinated programme of science and technology for secondary schools can be devised.

Co-ordinated Science and Technology

The problem posed above can probably be resolved into finding answers to the three following questions:

(i) In the general context of a suitable kind of education at each level, what kind of co-ordinated science and technical studies are "right" for each of the intermediate and secondary levels of education?

(ii) What should be the achievement of pupils through this work at each of these levels?

(iii) How can they best be helped to achieve it?

Quite clearly, in attempting to find answers to these questions, there are two dangers: first of all, specifying objectives too closely so that they become so detailed and inflexible as to stifle any initiative on the part of the teacher and/or the pupil; secondly, of not being sufficiently specific and thereby failing to help those pupils and teachers with less initiative and, therefore, in greater need.

In order to try and find solutions to the three questions posed above, a broad pattern of aims is set out diagrammatically in Annex 1. Quite clearly, some of the aims are equally applicable to other areas of study, but as shown, some are more appropriate to science and technology.

In all the co-ordinated science and technology which can be undertaken, the practical elements should be emphasized and pressures which may be brought to bear to reduce this emphasis should be resisted. This should not be taken to mean that students should simply be asked to make something. All too often, they are given an "exercise to make" which has neither value nor meaning, but merely has a mark assigned to it before being thrown away. Artificiality should be avoided, since in co-ordinated science and technology, practicality should provide both the motivation for performance of the work as well as the criterion for its evaluation.

There should be emphasis on the steps to be taken in order to bring an idea to fruition, i.e., to produce a practical solution to a practical problem. These suggested steps are:

(i) analyse the problem;

(ii) synthesize as many solutions as possible;

(iii) select one solution;

(iv) translate this solution into material form:

a) technical drawing;
b) making the components;
c) fitting together and trial of completed articles.

(v) put into operation;

(vi) evaluate and feed back for any necessary modification.

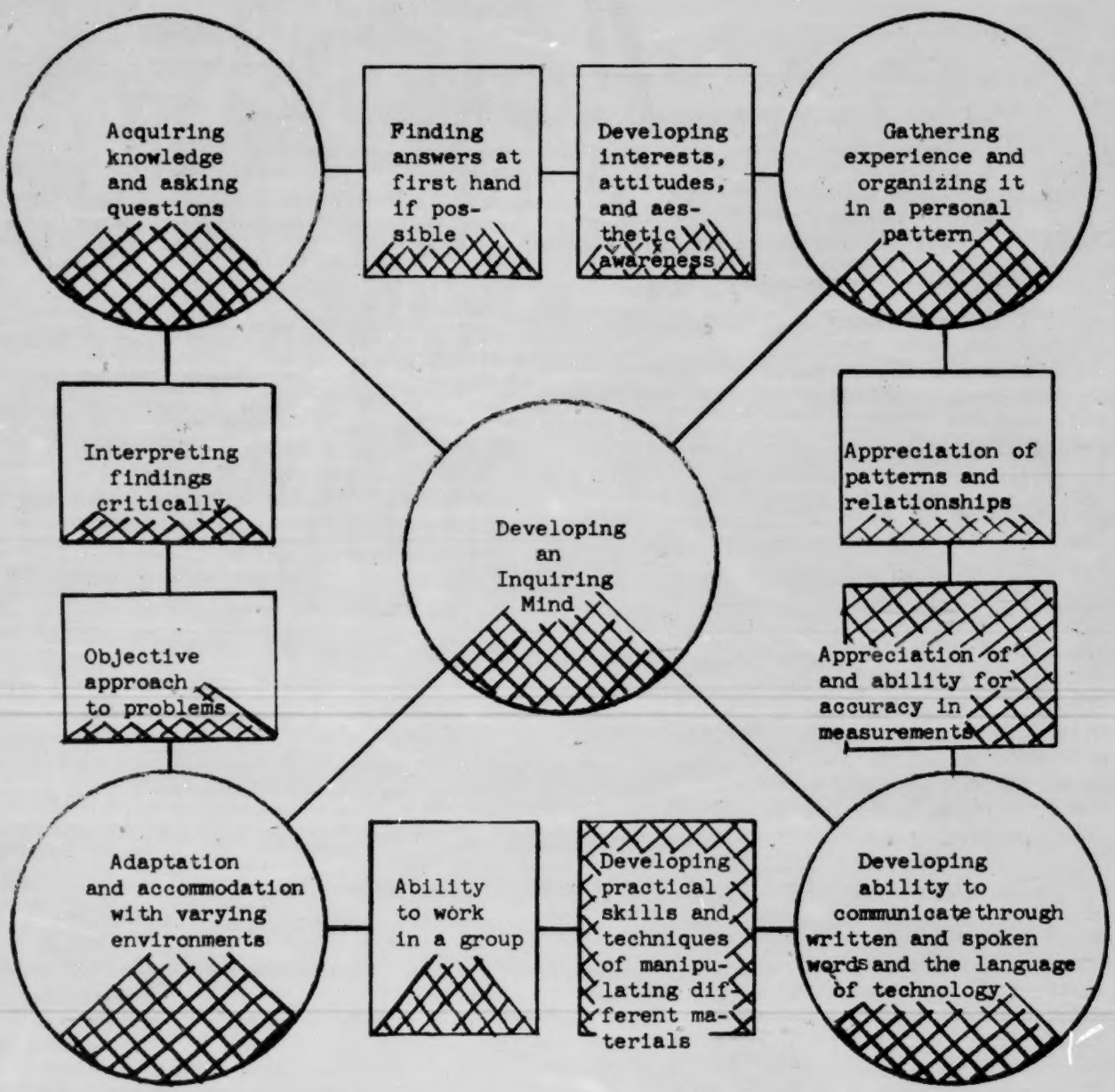
Students should learn and experience both the "why and how" things have been, and are presently being, done and in the process become acquainted with some of the necessary skills. There will need to be "think-tank" sessions in which practical problems should be posed without artificial data or any simplification of requirements, and all ideas for their solution should be allowed expression and openly subjected to serious analysis, however impossible the idea may appear to be at first.

In order to develop an awareness of the relationships between science, technology and industry, a study of industrial processes can be co-ordinated with science teaching, showing not only the scientific principles and research which are involved, but the practical problem which have been overcome in their application. In dealing with measurements in technology, degrees of accuracy and the need for absolute standards should be stressed; such work can be co-ordinated with science, particularly optics. The present tendency, when dealing with materials, to use only wood and metal should be broadened so as to include as many naturally produced materials and as wide a range of plastics as possible. Learning and experiencing the properties and manipulation of the materials can be co-ordinated with the relevant parts of the science syllabus.

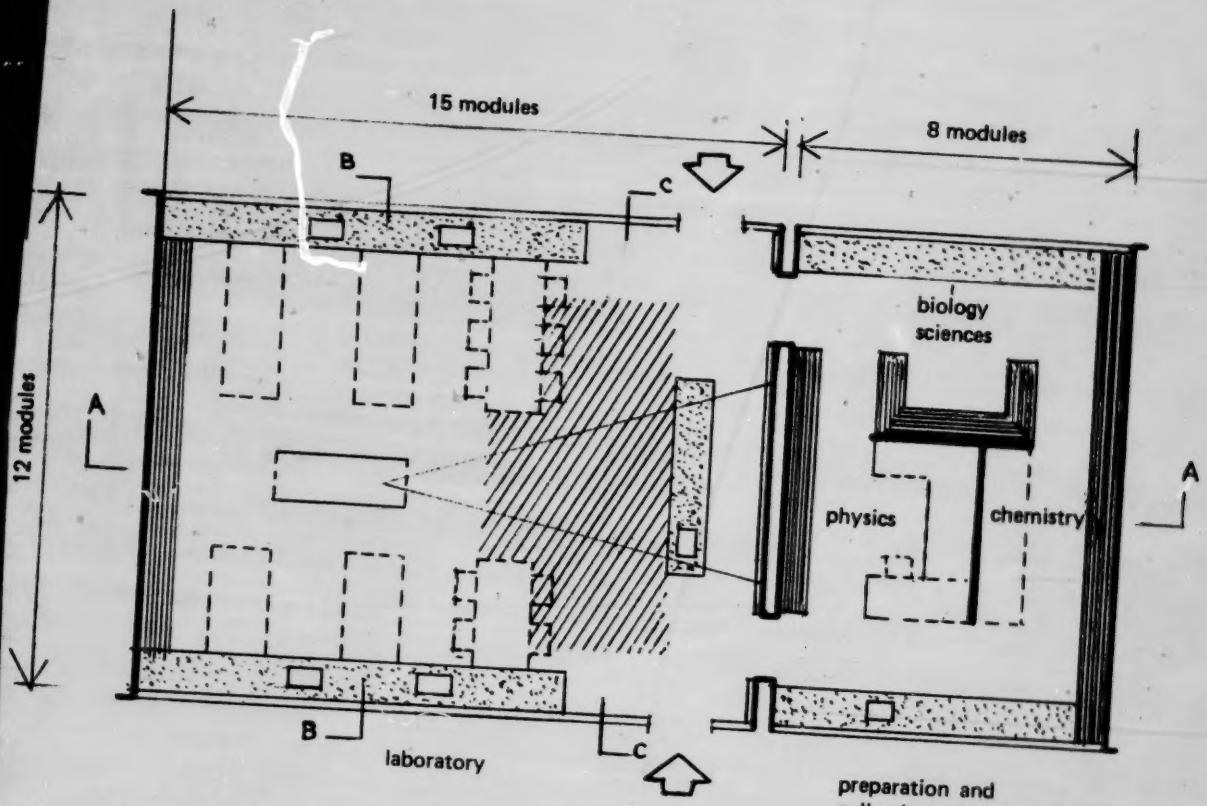
The physical facilities required for the kind of work outlined above will need to be more imaginatively conceived than is presently the case. Amongst other things, it will be necessary to provide space in which a variety of units can be dismantled and reassembled, and ideas in the form of prototypes can be tried out. At the expense of repetition, the need for practicality in the co-ordinated science and technology envisaged here should be stressed once again. As science, quite understandably, will become more and more theoretical and therefore dealt with on an increasingly mathematical basis, a knowledge and understanding of the empiricism of technology and its relationship to science can only satisfactorily be met by the essential elements of experience and practicality.

ANNEX I

A BROAD PATTERN OF AIMS


Acquiring knowledge and asking questions
Finding answers at first hand if possible
Developing interests, attitudes, and aesthetic awareness
Gathering experience and organizing it in a personal pattern
Interpreting findings critically
Developing an Inquiring Mind
Appreciation of patterns and relationships
Objective approach to problems
Appreciation of and ability for accuracy in measurements
Adaptation and accommodation with varying environments
Ability to work in a group
Developing practical skills and techniques of manipulating different materials
Developing ability to communicate through written and spoken words and the language of technology

Contribution from co-ordinated science and technology.



1 module = 60 cm

mobile furniture

fixed benches with services

shelves

instructional area

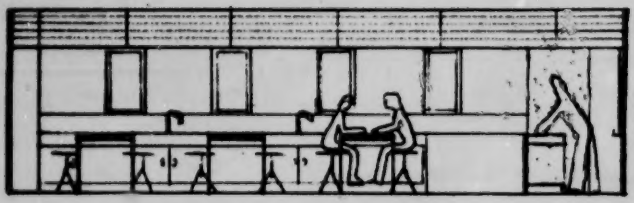
Multipurpose laboratory

capacity: 30 pupils

usable area:

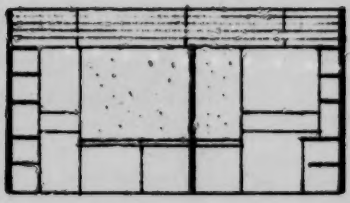
lab.:	64,8 sq. m
prep. & coll. room:	34,5 sq. m
Total:	99,3 sq. m
area per pupil place:	3,3 sq. m

scale: 1 cm pm.

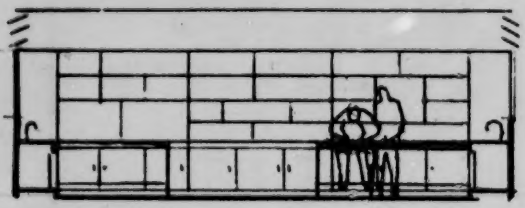


Section A.A

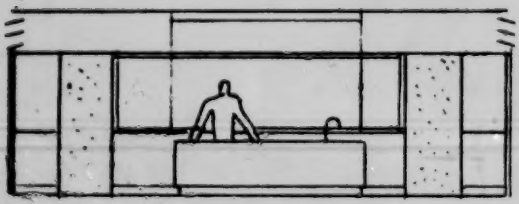
laboratory



preparation and collection room



Section B.B

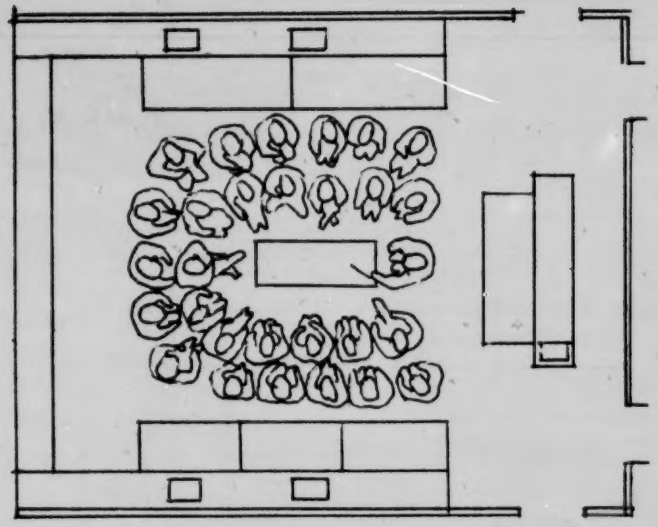


Section C.C

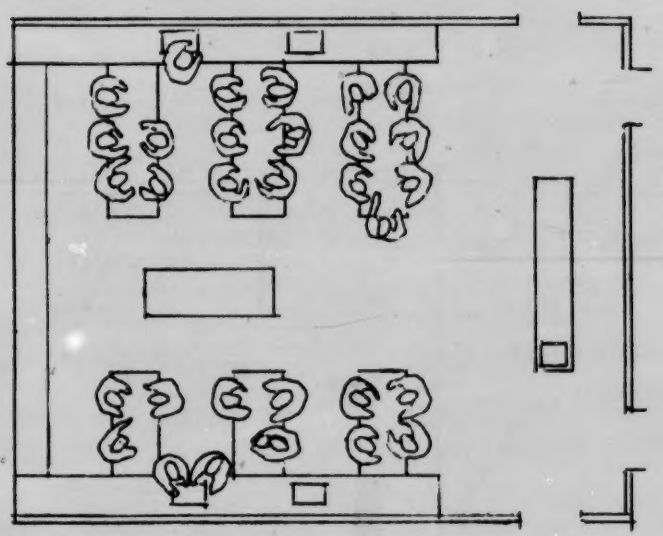
Multipurpose laboratory

capacity: 30 pupils

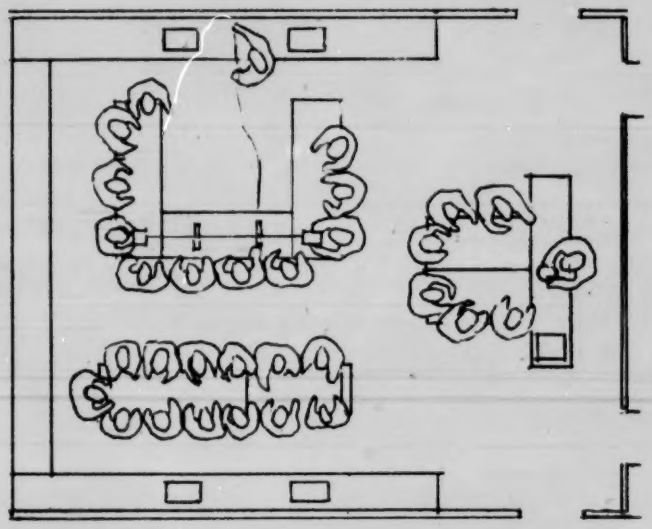
scale: 1 cm pm.



Briefing to class unit

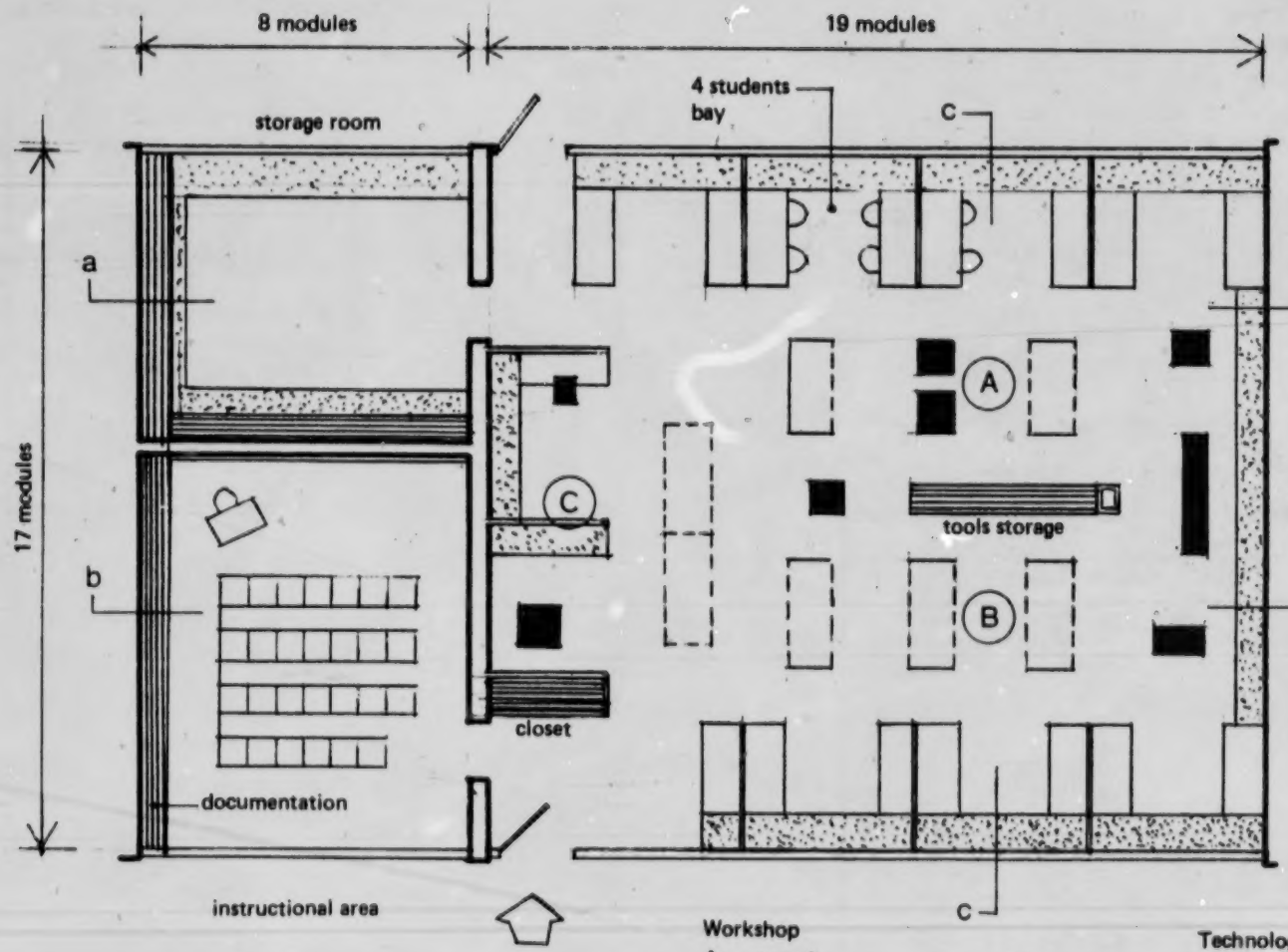


Practical exercise by small groups



Experimentation by large groups

Multipurpose laboratory
capacity: 30 pupils
Example of multi-use
scale: 1 cm pm.



Workshop

A - wood

B - metal

C - plastics etc...

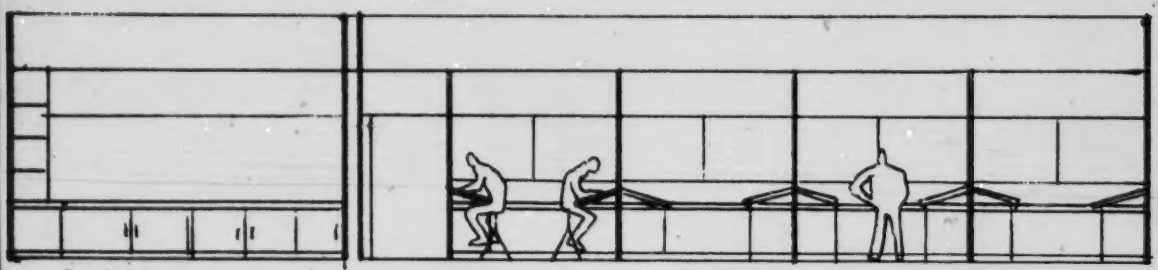
1 module = 60 cm.

Technology workshop

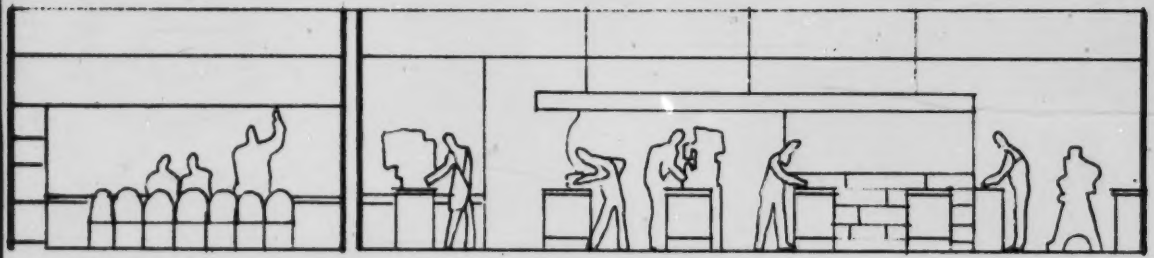
scale: 1 cm pm.

usable area

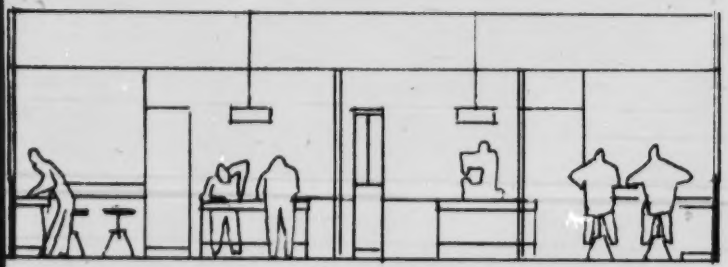
workshop and students bays:	116 sq.m
storage room:	20 sq.m
instructional area:	30 sq.m
Total:	166 sq.m
area per student place	5.5 sq.m



Section a.a



Section b.b



Section c.c.

Technology workshop
sections
scale: 1 cm pm.

5

A PROPOSAL FOR VOCATIONAL TRAINING IN LEAST DEVELOPED COUNTRIES

by

H. Baritsch

A PROPOSAL FOR VOCATIONAL TRAINING IN LEAST DEVELOPED COUNTRIES

A. The Demand - Structure

In many of the least developed countries where rudimentary industry exists it is not usually of a type which requires craftsmen with competence in a broad range of skills. For example, the soft drinks industry, biscuit factories and cement mills, need technicians for the upkeep and maintenance of the plant, as do all those industries producing mass goods with a low degree of technological sophistication. Usually these types of industries are operated by what are often called "semi-skilled" workers. These workers, however, may, in fact, be highly skilled but only in a rather narrow range of repetitive skills. These skills relate so closely to the actual conditions of production that their acquisition is most often achieved through "on-the-job" training. Because of widespread versatility it does not, in general, take much time for workers to acquire the requisite skills even if systematic "on-the-job" instruction is not provided.

The traditional "artisanat", too, employs technical skills. In the main, the artisanat is organized along lines which are rather similar to that of the above types of industry, with the major difference, however, that the artisanat is labour intensive, whereas industry is capital intensive. In many instances, the artisanat produce their goods through a system of highly specialized craftsmen in small shops who, together, may even form elements of what may be considered the equivalent of an assembly line. All these activities require considerable skills, particularly because they are carried out with almost no equipment, but the skill range is limited. As in the industry case the skills are absorbed through watching, helping and doing, sometimes arranged in the form of a traditional apprenticeship.

There may, of course, also be the craft-masters who produce luxury items in response to individual demand. This, however, is the exception rather than the rule. The high skill competence required is achieved through long practice, a part of which can be considered to be an apprenticeship.

As a general rule, electricians, plumbers, radio, business machine, watch and car repairmen have, for the greater part, discovered rather than learned their craft, often by trial and error, and at the expense of their customers who usually have no other alternative than to employ these types of "craftsmen". The educational attainment of the latter is low, as is only to be expected in countries with low literacy rates. Many, in fact, are illiterate. Workshops are poorly equipped.

Where local personnel are unavailable to control the technical work of foreigners working in the country, there is a demand for local technicians, especially in the building industry, road construction and government administration.

Thus, a need exists to improve skill competence and, thereby, productivity in modern and semi-modern trades, e.g., electricity, car repair, building trades, repair of electrical and electronic appliances. There may even be a need for training in woodworking. There is also a need to up-grade the skills of the traditional artisanat without, however, decreasing its absorptive capacity for local labour.

B. The Supply

In many LDC's, technical secondary schools exist which cater for the developing infant industries' demand for technicians. In many cases, these schools supply only a minimal number of technicians for the industry. Two reasons militate against a balance of supply and demand. The fact that secondary school graduates fare much better in non-technician careers (engineering studies or any other university level study and subsequent professions) and, secondly, the frequent disinclination of employers to accept the graduates of these schools. It is a mute question whether the reasons advanced for non-acceptance are valid. What matters is that they exist. Thus, attention needs to be given to the structuring of secondary technical schools in such a way as to match the demand for, and the supply of technicians. Since, however, the institutional frame for the provision of technicians already exists, these questions are not of concern here.

As for the remainder, the most important source for the provision of skills is the traditional, artisan apprenticeship, the efficiency of which should not be underestimated. It is true that skills could be acquired in less time if training were divorced from production, and provided in a systematic form, but it is equally true, that such a divorce would deprive the national economy of many minor jobs which contribute, in an under-capitalized economy, to employment and production.

Thus, it will be seen that the requirements for technicians can usually be met by existing training schemes, and, to some extent, for artisan training also, but here qualitative deficiencies remain. But there is no training worth speaking of for the modern and semi-modern trades, particularly in the building and servicing trades. This lack of training, and the resulting low level of competence and productivity, constitutes a shortcoming which can assume dangerous proportions for the country's development.

C. Socio-Economic Considerations

With the exception of a few craftsmen with a masterly competence in their trade, the pay-scale for workers is low, even extremely low. For this reason, the increase in the life-time earning capacity of a craftsman, who, after the completion of primary education, has under-gone a systematic and institutional training of two years' duration or more, over that of a self-styled "craftsman" who has picked up his skills through trial and error, is not large enough to make the large outlays necessary for modern vocational training (capital and recurrent expenditure) economically justifiable.

Furthermore, the "new" type of a craftsman[1/] who has undergone systematic vocational training requires a full range of modern equipment, spare parts, etc., so that he can put his skills and knowledge to a more productive use. Without these, he is unable to do so. Many of the LDC's can ill afford these under present economic conditions. But even if they were imported, the products and/or services of the "new" craftsmen would necessarily be expensive, as the need to earn a dividend on the capital invested would force prices up. Thus, the "new" craftsmen would, at best, cater only for a limited market: their clientele would be the owners of what must in the local context be considered luxury items.

1/ i.e. "new" in the socio-economic context of many LDC's.

It is doubtful whether this limited market would be large enough to sustain more than a handful of craftsmen. It would certainly not be large enough to offer job opportunities to all the skilled craftsmen produced by a large training centre. The latter must be large to be economically viable; the operation of a training centre for a smlal number of people would be uneconomic. Thus, if all the graduates of a centre for systematic vocational training sought work in their field, they would either price themselves out of the market, or they would, through cut-throat competition, force others out of a job. An attempt, therefore, to create a new type of craftsman, or a new labour force parallel to the existing one, would, in all probability, lead to failure and a mis-allocation of scarce resources.

Vocational training, of course, is needed. But it should be provided in such a way that its cost does not outweight its likely returns. To achieve this kind of training, it would seem that it must not follow the usual pattern[1]: i.e. training with no production component first, and production with no training component thereafter. In other words, the divorce of training and production, and the concept of "pure" training on the one hand, and "pure" production on the other needs to be overcome to arrive at an economically viable concept of vocational training in many of the LDC's.

An integrated "production-cum-training scheme" would, perhaps, be the most advantageous solution. In such a scheme, training becomes just one particular aspect of doing, i.e. of production, though certainly one of major importance. Training personnel as such, as well as training equipment as such, would cease to exist: both staff and equipment would be justified on the grounds of the productive work done by and with them, and they would, at least for the greater part, earn what they cost. Because of this, the training which would be fully integrated into the normal production or work process, would give rise to only marginal supplementary cost.

This type of training would also have socially beneficial consequences. Not being expensive per trainee-year its duration would not be a matter of great concern. Therefore, it could be geared to the needs of a social stratum with a low level of general education. The trainees might need a longer duration of training than those who have been trained in school-type activities, and who achieve their skill competence through actually doing their work. This type of integrated training would offer a way of social advance to a population for whom the door of education, as a means of social advancement, will remain closed for some time.

Another social advantage of this kind of training scheme is that the participants learn in real-life jobs. This means that they are not alienated from the general pattern of work organization in their society which is usually characterized by the intensive use of labour and relatively little demand for capital goods and physical resources. Thus, vocational training based on the lines described above would ameliorate and not disrupt the existing social fabric.

1/ A pattern, of course, which remains valid for countries emerging from different conditions.

D. Educational Considerations

Owing to the generally low level of educational attainment which is likely to prevail for the next few years, there is little probability that a sufficient number of applicants with completed primary or lower-secondary education of a reasonably good quality would be available for systematic vocational training of a medium or long duration. For this reason vocational training needs to be organized for a clientele with only modest, and even low standards of formal education.

Experience with systematic vocational training in training institutions does not lend much support to the notion that this is the most effective form of training in a practically pre-industrial type environment. In this situation, the organization of new techniques and technologies, which do not make extreme demands on the theoretical understanding of underlying scientific principles, can best be achieved by actually doing them. If they are taught in a way removed from the real conditions under which they are to be applied, trainees tend to consider them as something as real (and inapplicable) for them as, say, the poetry of Chaucer.

From an educational view, a school-type institutional training which separates training for, from the exercise of a job is unproductive. Vocational training should, therefore, in the main, be provided in a form that integrates training and production. An apprenticeship where trainees proceed from watching, to helping and doing, is the most suitable way to do this.

E. A Possible Project

A possible "production-cum-training scheme" could be established initially in the form of a UN Work Unit, where:-

(i) the UNDP finances the initial equipment, replaces it as and when required, and provides an initial stock of materials and spare parts;

(ii) the UNDP also provides initial staffing and management to first train the majority of the staff; thereafter the staff would be recruited locally;

(iii) the project would serve a principal group of clients - UN Specialized Agencies working in the country; 1/

(iv) the customers pay for the work in the same way as they would in any other commercial enterprise;

(v) the returns for the work executed would in general be high enough to finance the day-to-day operations of the garage.

The "raison d'être" of the Unit is not that its services are cheaper than others, but that services of an acceptable quality are actually being provided which would not otherwise be the case.

1/ Other customers might be served to the extent that capacities permit.

Depending on the services most urgently needed, the Unit could comprise the following sections:

- Building Section with sub-sections for reinforced concrete work, civil work, woodwork;

- Installation Section with sub-sections for sanitary installation and electrical installation;

- Heavy Mechanics Section with sub-sections for auto-mechanics and heavy duty mechanics (e.g. road building equipment, construction equipment, cranes, etc.);

- Elements Section with sub-sections for electric and electronic appliances.

The Unit would be organized like a chain of technically independent workshops which have, however, a common business management. The advantages of such an organization, apart from the training potential established are the following:

(i) Imperfections in the local capital market would be overcome through the mobilization of international capital for socially and economically productive purposes;

(ii) The initial employment of expatriates in the form of experts to overcome initial shortage of human skills would avoid the permanent residence of foreign labour;

(iii) Jobs are created which would not otherwise be created because of the lack of local capital and skills.

There is the additional advantage that by providing servicing skills, imports are reduced, since unserviced items need to be replaced totally while, with proper servicing, equipment enjoys a longer life. It could of course be argued that market forces will see to it that services are provided, if these services are really of such vital importance. This may be so. But the time factor is important in this respect, and it is a fact that these services are either not being provided now or to a sufficient degree. There is also the important question of who provides the services. In the absence of a scheme of the type outlined, it is usual to find foreigners entering the market and establishing themselves permanently in an LDC depriving citizens of job opportunities.

The financial viability of the project would, of course, depend on whether or not sufficient business is likely to exist for the Unit to become self-supporting within a period of two to three years. For obvious reasons, no detailed studies in this respect can be undertaken in abstracto. There are, however, indications that the potential volume of business in the fields envisaged for the Unit would be enough to achieve this objective.

In addition to the above sections which are justified on the grounds of economic viability, there should also be a management section for the services sections combined, including educational services to take care of the work-related educational activities of the Unit.

Admission to the Unit for apprentice training should be without reference to formal education. It could be made conditional on passing an aptitude test, but this would have to be carefully designed to be educationally and culturally neutral. It could also be a condition for admission that candidates have an affiliation to the desired specialization, be it through helping in a small shop or through the occupational activities of parents.

As shown in Annex I, the project would have places for 44 apprentices; this number could, without difficulty, be increased by as much as one-third, if the development of the labour market warranted expansion. Assuming that it takes four years to train an apprentice to an acceptable standard[1/], the annual output would be about ten skilled craftsmen. If, with improved educational backgrounds the course length could be later reduced to three years, and the number of apprentices increased simultaneously, the output could be brought to about 20 craftsmen per year.

Provision should also be allowed for training during evening hours for adults who pursue occupational activities during the day-time. This training should also be aligned to real-life jobs and the groups of trainees should, therefore, not be much larger than during the apprentice day-time training. While the method of training would closely resemble apprentice training, it would differ significantly in one respect - its duration. The courses should range from one week to one month and be far more specific in content and objective than the apprenticeship course; e.g. typewriter maintenance rather than office machine mechanics.

Both apprentices and evening class trainees should receive some incentive pay which should be related to their productive contribution to the Unit. For apprentices, consideration should be given to the establishment of a scheme under which part of the pay might be withheld until the completion of apprenticeship, when they would receive a lump sum enabling them to purchase some basic equipment for setting up their own shops. Care should be taken that the incentive pay should not be parallel to that of a student stipend (which would, in effect, turn training for a profession, into a profession itself and a rather well paid one at that).

The staff requirements for the proposed Unit are detailed in Annex I. The professional staff to be provided by the UN should not, however, have the normal status of experts who work in an advisory capacity. Rather, they should work under a system similar to the OPEX scheme, i.e. they should have full operational responsibility for the Unit. Within a period of two to three years, the Unit should become self-supporting, with perhaps the exception of additional cost incurred through apprentice training and other educational activities such as work-related adult literacy work. To the extent that self-sufficiency is achieved, the contribution of the UN to the experts' salaries should be revised.

1/ This rather long period seems to be needed, initially, because of the expected low level of general education of the applicants.

The total number of man-years needed would (in the example given) be 58, assuming a tapering off of expert services after three years. Chiefs of Sections and the management would serve for a period from five to six years. Under these assumptions, the staff costs would be in the range of US.$ 2,088,000 (at US.$ 36,000 standard costs per man-year). This is, of course, a high amount for the training of (during a six-year period) some 40 apprentices. But the costs for the setting-up and the operation of a training institute would not be less, though they would not be offset by the contribution the Unit makes to the national economy. It is certain that an institution for vocational training only, would have produced many more trainees and have, thereby, flooded the labour market with job seekers for whom no jobs exist.

UN WORK UNIT

Suggested Staffing and Costing

Section/Sub-Section	Professional Staff (UN Experts) - Designation -	Volunteers	Local Staff	Apprentices	Evening Class Trainees	Surface Areas (sq.m.) (Gross Area)	Building Cost 1/ (in 000's)	Furniture Cost (in 000's)	Equipment Cost (in 000's)
Building Section 3/									
Concrete Work	1 Expert	2	3	4	4	60 2/	39	2	40
Civil Work	1 Expert	1	2	4	4	40 2/	26	2	32
Woodwork	1 Expert	2	3	4	4	160	104	6	210
Installation Section 3/									
Sanitary Installation	1 Expert	2	3	4	4	80	52	6	90
Electrical Installation	1 Expert	3	5	8	8	60	39	2	60
Heavy Mechanics Section 3/									
Auto Mechanics	1 Expert	2	3	4	4	240 2/	156	8	280
Heavy Duty Mechanics	1 Expert	2	3	4	4	180 2/	117	8	224
Implements Section 3/									
Electrical Appliances	1 Expert	1	2	4	4	100	65	6	64
Electronic Applicances	1 Expert	1	2	4	4	60	39	6	112
Office Machines	1 Expert	1	2	4	4	60	39	6	54
Education Section	1 Senior Expert	-	2	-	-	40	26	8	16
Administration	1 Manager) 1 Engineer) 1 Accountant)	1	4	-	-	40	26	12	18
Total 4/	14	18	34	44	44	1,120	870	72	1,272
GRAND TOTAL COST 5/							2,248		

1/ At an average of 65 per sq.m.
2/ Plus covered open space.
3/ Each section to be headed by one of the experts.
4/ Building cost = net area + 15% circulation + 4% walling.
5/ Including 12% for site development and physical contingencies.

6

COMPARATIVE ANALYSIS OF SPACE REQUIREMENTS AND TEACHER NEEDS BETWEEN EDUCATIONAL METHODS

by

R. Aujame

COMPARATIVE ANALYSIS OF SPACE REQUIREMENTS AND TEACHER NEEDS BETWEEN EDUCATIONAL METHODS

The purpose of this study is to evaluate and compare educational space requirements and teacher needs between two different systems of education using the same curriculum.

(a) the traditional system, or one-way teaching, with the transmission of knowledge from teacher to a group of pupils;

(b) the team and group educational system whereby a more active participation, either in team, or individual, work is required from the pupils and where teams are distributed not by age but in accordance with learning ability of the pupils.

Educational Space Requirements

A standard curriculum for a College d'enseignement général (CEG): (secondary first-cycle: grade 7 to 10) in a French-speaking country in Africa has been used for the analysis as a basic educational programme common to both systems. Table I shown in the attached Annex gives the present distribution of weekly periods per subject, per grade. From this element two different tables have been prepared showing teaching loads and schedule of accommodation based on a total enrolment of 640 pupils:

- One (Table 2) is based on the traditional system with a fixed class group of 40 pupils. It indicates the number of groups per grade, the distribution of periods per subject and per type of facility, as well as the number of accommodation units required corresponding to the best use factor;
- The second, (Table 3) is based on team- and group-learning system and shows the distribution of weekly periods, per subject, per type of group. Here, the distribution of pupils has been done in groups of various sizes, as follows:

  (a) Large group: Assemble 4 groups of 40 pupils each of the same grade. (Ex: 4 streams 7th grade = 160 pupils) mainly for lecture, including film or slides presentation, T.V. shows, etc. on a subject common to all groups;

  (b) Middle group: Corresponds to traditional class-group size of 40 pupils for lecture or blackboard-teaching method;

  (c) Small group: Twenty pupils maximum; the seminar-type of grouping where a more direct participation from the pupil is required. This constitutes the most innovative element, as it will permit adaptation of the methods to the pupil's

learning ability. In this case, pupils are grouped in accordance with their capacity for learning in each of the basic subjects. For instance, mathematics - grade X: the better pupils in maths, will form one group with a teacher, proceeding eventually to a more rapid pace, which will mean no wasted time for the pupils, whilst those of average level will form one or several groups and will proceed with the programme at normal speed. The less-gifted pupils, in a separate group, will receive intensive courses to enable them to catch up with the others;

(d) Group working on specialized activities, requiring active participation on workshop activities, either 20 pupils (language laboratory, arts and crafts, etc.) or 40 pupils (natural science laboratory).

(e) Finally, the last group to be considered is the individual pupil working alone in the study carrel of the learning resource centre. This form of learning requires the full involvement of the pupils. It also permits the teacher to check the pupil's degree of knowledge.

- Table 4 shows the type and amount of accommodation units required in this case. It is obvious that the distribution of pupils into Modern and Classic sections will be more flexible in the case of team approach. This distribution has been kept in order to make possible the comparison between the two methods.

Table 5 - comparative analysis of required accommodation between the two systems calls for the following comments:

- The same amount - 18 units - is required in both cases with a slight difference in net area per square metre (32 sq.m.) in favour of the new system (1,347 sq.m. as opposed to 1,379 sq.m.).
- In general, the new system gives better utilization in the use of rooms. For instance, even the large-group unit, used for meetings approximately 22 periods per week; this could be adapted for group-type activity, such as music practice, etc., by introducing into the design the possibility of ad-hoc partitioning.
- The organization of space in the arts and crafts workshops (two rooms, in the new system, instead of one) permits a better diversification of activities (wood carving, drawing, model-making). In addition, each room can also receive a group of 20 students for theoretical music courses.
- Twelve rooms for the new system as opposed to five for the traditional will have a capacity of 20 students, allowing better communication between both teacher and pupil, as well as between the pupils themselves, in the case of group activity.

- The learning resource centre which, with a capacity for 80 students becomes the focal point of the college, has a total net area (210 sq. m.) that is almost two and a half times the net area of the library (90 sq.m.) in the traditional college. More than half this space concerns individual study activities.

Teachers Needs

Table 6 indicates for each system the number of weekly teaching periods per subject, per grade. On the basis of an authorized maximum weekly load of 22 periods per teacher, the number of teachers is as follows:

	Traditional Teaching	Group Learning
French	4	5
Mathematics	5	4
Foreign Language I	3	4
Foreign Language II	1	1
Latin	1	1
Greek	1	1
Technology	3	3
Social Sciences	3	1
Natural Sciences	2	1
Arts and Crafts and Drawing	2	2
Domestic Science	1	1
Music	1	1
Total	27	25

The list shown above is theoretical and presented for the purpose of comparison. Several possibilities exist, in both the following cases: to reduce the number of teachers, for instance as regards overtime, and the merging of subjects under one teacher. Foreign language I requires one more teacher in the new system since the language laboratory takes 20 students instead of 40 in the traditional system. On the other hand, a high percentage of courses provided to large groups (160) as well as individual study in social and natural sciences serves a considerable amount of teaching load. (Natural sciences: 13 periods against 32: Social sciences: 24 periods against 64).

More significant is the information given in Table 7 showing the number of periods under and over the limit of 22 periods per teacher, per week. Not only is

it less important in the new system but also the 33 periods of unemployed teachers could easily be used in supervision of individual study activity in the learning resources centre.

The conclusion which can be gathered from this analysis is that the difference between the two systems in terms of space requirements and teachers' needs is minimal and slightly in favour of the group and individual learning system. But the most valuable advantage brought about by this system, in comparison with the traditional one, is flexibility offered both in the use of teachers and space. The introduction of space for large group courses leaves free time available to three teachers for tutorial work. The same space, moreover, could be converted into smaller rooms when necessary. Furthermore, the introduction of a large area for individual study with easy access to the resource centre permits a more direct involvement of the individual pupil in the learning process. The predominance of small group units - 20 students maximum - facilitates communication between teacher and pupil and, in the case of practical activities, (in workshops and laboratories), better communication between pupils. All those spaces could easily be adapted to any new form of curriculum, such as integrated subjects system. To sum up it provides, at no extra cost, a more efficient tool geared toward the quality of education.

TABLE 1

WEEKLY TIME-TABLE

(in periods of 50 minutes)

Subjects	7		8		9				10			
	Modern	Classic	Modern	Classic	Modern	Classic I	Classic II	Classic III	Modern	Classic I	Classic II	Classic III
French	6	6	6	6	5	5	5	5	5	5	5	5
Mathematics	6	6	6	6	6	6	6	6	6	6	6	6
Foreign Language I	5	5	5	5	3	3	3	3	3	3	3	3
Foreign Language II	-	-	-	-	3	-	3	-	3	-	3	-
Latin	-	4	-	4	-	3	-	3	-	3	-	3
Greek	-	-	-	-	-	3	3	-	-	3	3	-
Technology	-	-	-	-	4	4	4	4	4	4	4	4
Social Sciences	3	3	3	3	3	3	3	3	3	3	3	3
Civics	1	1	1	1	1	1	1	1	1	1	1	1
Natural Sciences	2	2	2	2	2	2	2	2	2	2	2	2
Drawing	1	1	1	1	1	1	1	1	1	1	1	1
Music	1	1	1	1	1	1	1	1	1	1	1	1
Handicrafts	1	1	1	1	1	1	1	1	1	1	1	1
	26	30	26	30	30	33	33	30	30	33	33	30

Note: In addition, two periods of Physical Education for all grades.

TABLE 2

TRADITIONAL TEACHING : TEACHING LOAD AND REQUIRED ACCOMMODATION UNITS

Subject	No. of Weekly Periods Per Grade, Per Subject					Accommodation Units						
	Grades: 7	8	9	10	Total	Ordinary Classroom 40 studs.	History & Geography 40 studs.	Science Laboratory 20 studs.	Technology Room 20 studs.	Drawing Room 40 studs.	Domestic Science 20 studs.	Arts/Crafts 20 studs.
No. of Streams 4	4	4	4									
French	24	24	20	20	88	88						
Mathematics	24	24	24	24	96	96						
Foreign Language I	20	20	12	12	64	64						
Foreign Language II	-	-	6	6	12	12						
Latin	8	8	6	6	28	28						
Greek	-	-	6	6	12	12						
Technology 1/	-	-	32	32	64	-			64			
Social Sciences	12	12	12	12	48		48					
Civics	4	4	4	4	16		16					
Natural Sciences	8	8	8	8	32			32				
Drawing	4	4	4	4	16					16		
Music	4	4	4	4	16	16						
Arts and Crafts 1/	8	8	8	8	32						16	16
Total and Distribution of periods:					524	316	64	32	64	16	16	16
Required Accommodation Units:						9	2	1	2	1	1	1
Use Factor %						97%	88%	88%	88%	44%	44%	44%

Note: 1/ 20 students.

TABLE I

TEAM AND GROUP TEACHING DISTRIBUTION OF WORK LOAD

Teaching and Learning Types	Group Size	Subjects and Themes	Number of periods per week per grade																					
			7		8		Sub Total	No. of Groups Per Grade	Total No. of Weekly Periods	9				10				Sub Total	No. of Groups Per Grade	Total	Grand Total No. of Weekly Periods
			Modern	Classic	Modern	Classic				Modern	Classic I	Classic II	Classic III	Modern	Classic I	Classic II	Classic III				
General courses, conferences, films, slides, T.V. shows	Large Group 160 Pupils	French	1		1		2	1	2			1				1		2	1	2	4
		Mathematics	-		-		-	-	-			1				1		2	1	2	2
		Foreign Language: I	½		½		1	1	1	½	-	½	-	½	-	½	-	2	1	2	3
		Foreign Language: II	-		-		-	-	-	-	-	-	-	-	-	-	-	1	1	1	1
		Latin	-		-		-	-	-	-	½	-	½	-	½	-	½	1	1	1	1
		Greek	-		-		-	-	-	-	½	½	-	-	½	½	-	1	1	1	1
		Social Science and Civics	2		2		4	1	4			2				2		4	1	4	8
		Natural Sciences	½		½		1	1	1			½				½		1	1	1	2
		Music	½	½	½	½	2	2	4	1	1	1	1	1	1	1	1	8	1	8	12
		Total							12											22	34
Traditional Teaching (one way)	Middle Group 40 Pupils Maximum	French	1	1	1	1	4	2	8	1	1	1	1	1	1	1	1	8	1	8	16
		Mathematics	3	3	3	3	12	2	24	2	2	2	2	2	2	2	2	16	1	16	40
		Latin	-	2	-	2	4	2	8	-	2	-	2	-	2	-	2	8	1	8	16
		Greek	-	-	-	-	-	-	-	-	2	2	-	-	2	2	-	8	1	8	8
		Social Sciences	1	1	1	1	4	2	8	1	1	1	1	1	1	1	1	8	1	8	16
		Total							48											48	96
Seminar	Small Group 20 Pupils Maximum	French	3	3	3	3	12	4	48	2	2	2	2	2	2	2	2	16	2	32	80
		Mathematics	2	2	2	2	8	4	32	1	1	1	1	1	1	1	1	8	2	16	48
		Latin	-	1	-	1	2	4	8	-	½	-	½	-	½	-	½	2	2	4	12
		Greek	-	-	-	-	-	-	-	-	½	½	-	-	½	½	-	2	2	4	4
		Foreign Language: I	1	1	1	1	4	4	16	1	½	½	½	1	½	½	½	5	2	10	26
		Foreign Language: II	-	-	-	-	-	-	-	1	-	½	1	1	-	½	1	5	2	10	10
		Total							104											76	180
Specialized Teaching (Workshop concept)	Small Group 20 Pupils Middle Group 40 Pupils	Foreign Language: I	2	1½	2	1½	7	4	28	2	2	2	2	2	2	2	2	16	2	32	60
		Foreign Language: II	-	-	-	-	-	-	-	1½	-	1½	-	1½	-	1½	-	6	2	12	12
		Technology	-	-	-	-	-	-	-	4	4	4	4	4	4	4	4	32	2	64	64
		Arts & Crafts and Drawing	2	2	2	2	8	4	32	2	2	2	2	2	2	2	2	16	2	32	64
		Nat. Sciences Laboratory	1	1	1	1	4	2	8	1	1	1	1	1	1	1	1	8	1	8	16
		Music	½	½	½	½	2	4	8	-	-	-	-	-	-	-	-	-	-	-	8
		Total							76											148	224
Independent Learning (Learning Resource Centre)	Individual Tutorial	French	1	1	1	1	4	1	4	1	1	1	1	1	1	1	1	8	½	4	8
		Mathematics	1	1	1	1	4	1	4	2	2	2	2	2	2	2	2	16	½	8	12
		Foreign Language: I	1	1	1	1	4	1	4	½	½	½	½	½	½	½	½	4	½	2	6
		Foreign Language: II	-	-	-	-	-	-	-	½	-	½	-	½	-	½	-	2	½	1	1
		Latin	-	1	-	1	2	1	2	-	½	-	½	-	½	-	½	2	½	1	3
		Greek	-	-	-	-	-	-	-	-	½	½	-	-	½	½	-	2	½	1	1
		Soc. Sciences	1	1	1	1	4	1	4	1	1	1	1	1	1	1	1	8	½	4	8
		Nat. Sciences	½	½	½	½	2	1	2	½	½	½	½	½	½	½	½	4	½	2	4
		Total							20											23	43

TABLE 4

NUMBER OF REQUIRED ACCOMMODATION UNITS 1/

Subjects and Themes	Total No. of Periods all Grades	Distribution of Workload per Accommodation Unit								
		Theoretical Courses			Practical Courses					
		Large Group Unit 160 pup.	Middle Group Unit 40 pup.	Seminar Room 20 pup.	Language Laboratory 20 pup.	Natural Science Lab. 40 pup.	Home Science Lab. 20 pup.	Technical Room 20 pup.	Arts & Craft Work 20 pup.	Learning Resource Centre 80 pup.
French	108	4	16	80						8
Mathematics	102	2	40	48						12
Latin	32	1	16	12						3
Greek	14	1	8	4						1
Foreign Language I	95	3		26	60					6
Foreign Language II	24	1		10	12					1
Social Sciences and Civics	32	8	16							8
Technology	64							64		
Natural Sciences	22	2				16				4
Music	16	12							8 2/	
Arts & Crafts (drawing, handicraft, domestic sciences)	64						16		48	
Total and Distribution of Periods	573	34	96	180	72	16	16	64	56	43
Required Accommodation Units		1	3	5	2	1	1	2	2	1
Use Factor %		94%	88%	100%	100%	44%	44%	89%	78%	100%

Note: 1/ Based on a maximum of 36 periods per week (40 periods with 10% flexibility factor).

2/ Two groups of 20 - Solfege.

TABLE 5

COMPARATIVE ANALYSIS SCHEDULE AND AREAS OF ACCOMMODATION

Accommodation Units	No. of Students Per Unit	Traditional Method			Team & Group Method		
		No. of Units	Net area in sq. m,		No. of Units	Net area in sq.m.	
			per unit	total		per unit	total
Large group unit	160	-	-	-	1	128	128
Middle group unit	40	9	64	576	3	64	192
Seminar room	20	-	-	-	5	32	160
Specialized room	40	2	80	160	-	-	-
Language laboratory	20	-	-	-	2	56	112
Natural Science laboratory (including store and preparation room)	40	1	145	145	1	145	145
Technology room	20	2	80	160	2	80	160
Domestic Science laboratory	20	1	80	80	1	80	80
Arts and Crafts workshop	20	1	80	80	2	80	160
Drawing room	40	1	88	88	-	-	-
Library	40	1	90	90	-	-	-
Learning Resource Centre	80	-	-	-	1	210	210
Total		18		1,379	18		1,347

TABLE 6

NUMBER OF WEEKLY TEACHING PERIODS PER SUBJECT, PER GRADE

	French			Maths.			Foreign Lang. I			Foreign Lang. II			Latin			Greek			Techno-logy			Social Science & Civics			Natural Science			Arts Crafts & Drawing			Domestic Science			Music		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
7	6	24	29	6	24	29	5	20	22	-	-	-	4	8	8	-	-	-	-	-	-	4	16	6	2	8	2½	2	8	12	1	4	4	1	4	4
8	6	24	29	6	24	29	5	20	22	-	-	-	4	8	8	-	-	-	-	-	-	4	16	6	2	8	2½	2	8	12	1	4	4	1	4	4
9	5	20	21	6	24	17	3	12	22	3	6	11	3	6	6	3	6	6	8	32	32	4	16	6	2	8	4	2	8	12	1	4	4	1	4	4
10	5	20	21	6	24	17	3	12	22	3	6	11	3	6	6	3	6	6	8	32	32	4	16	6	2	8	4	2	8	12	1	4	4	1	4	4
Total	88		100	96		92	64		88	12		22	28		28	12		12	64		64	64		24	32		13	32		48	16		16	16		16
No. of Teachers	4		5	4		4	3		4	1		1	1		1	1		1	3		3	3		1	1½		1	1½		2	1		1	1		1

Column 1 : Number of periods per week, per grade

" 2 : Corresponding number of periods per week for a Traditional CEG : 640 pupils

" 3 : Corresponding number of periods per week for a renovated CEG : 640 pupils

Note: In the case of new methods (column 3) the periods corresponding to individual studies have not been included. Teachers of the less loaded subjects (Greek, Natural Sciences, French, etc.), and even senior students from 2nd cycle could supervise the 80 pupils working in the learning resource centre.

TABLE 7

NUMBER OF PERIODS OVER AND UNDER
AUTHORIZED TEACHER WORKLOAD

(22 periods per week)

Subject	Traditional				New			
	Number of Periods	Number 1/ of Teachers	Remaining Number of Periods + or -		Number of Periods	Number of Teachers	Remaining Number of Periods + or -	
			+	-			+	-
French	88	4	0	0	100	4	12	-
Mathematics	96	4	8	-	92	4	4	-
Foreign Language I	64	3	-	2	88	4	0	0
Foreign Language II	12	1	-	10	22	1	0	0
Latin	28	1	6	-	28	1	6	-
Greek	12	1	-	10	12	1	-	10
Technology	64	3	-	2	64	3	-	2
Social Science	64	3	-	2	24	1	2	-
Natural Science	32	1½	-	1	13	1	-	9
Arts and Crafts	32	1½	-	1	48	2	4	-
Domestic Science	16	1	-	6	16	1	-	6
Music	16	1	-	6	16	1	-	6
Total		26	14	40		24	28	33

Note: 1/ Based on maximum 8 hours overtime per teacher.

7

ELEMENTS OF RURAL DEVELOPMENT

by

R. Brain

ELEMENTS OF RURAL DEVELOPMENT

I

APPROACHES TO RURAL DEVELOPMENT

The complexity of the mechanisms involved in rural development, coupled with the extreme variations found in actual rural situations, often overshadow some of the more basic issues. This is particularly true of the approach to rural development. An examination of the issue, however, leads to the conclusion that, in fact, there are basically only two main approaches, the equity approach and the self-development approach.

The Equity Approach

In this approach rural development is viewed within the framework of national development, and thus, contrasted with urban development. In the majority of cases, urban areas have been the forerunners in national developmental processes. Resources are devoted to providing towns with electricity supplies, drainage, good roads and running water supplies; adequate school systems are developed; universities are established; doctors and hospitals are available and cultural activities, theatres, concert halls, cinemas, etc. become part of life patterns.

As development continues the contrast between urban areas and rural zones can widen quickly, and, without a conscious and deliberate reallocation of national resources the imbalance between urban and rural conditions, with regard to the quality of life and economic activity, soon becomes extreme.

Equity considerations provide the principal force for a conscious diversion of national resources to rural areas, and form a base for rural development policies.

The Self-Development Approach

Stress in this case is applied to the theory that rural development can arise from internal processes.

Basically this theory is dependent on a concept of dichotomy within a nation, on the one hand, industrial/urban and on the other rural. Following from this is the idea that the industrial/urban[1/] sector has been self-developing. Therefore, given reorganization, maximization of local resources, and certain knowledge inputs, the rural sector can also become self-developing.

The dichotomy approach tends to avoid direct contrasts between urban and rural conditions. It accepts differences in qualities between urban and rural life and allows for a balanced approach to this. Under a national framework, urban

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1/ In fact the urban sector has not been self-developing since development starts from resources coming from rural areas.

life will have some plus qualities and some negative, as will rural life. This approach accepts the need for different development patterns and varied speeds of change within a nation.

These two approaches to rural development are, however, compatible and can, in practice, be merged, forming dual axes of policies and actions, so that eventually it is only by way of the emphasis put in policy statements on particular points, or through the design of specific mechanisms of action, that the underlying approaches can be recognized.

The question of approach is important and in examining policies for rural development, or considering proposals for actions, the basic fact that there are two approaches should always be borne in mind.

In simple terms and taking educational planning as an example: (a) if the approach most heavily stressed in government policies is one of equity, then proposals for educational development in rural areas will tend towards the correction of the lack of educational opportunities, e.g. urban areas: secondary schools are provided to cover 30 per cent of relevant age-group; rural areas: secondary schools cover only 5 per cent of relevant age-group. The logical proposal would be to place more secondary schools in rural areas and thus alleviate the imbalance; (b) if, however, policy stress is placed on self-development, then proposals will be more oriented towards the relevance of education to rural life and be biased primarily towards changes in curriculum as a prerequisite for educational expansion, and towards the planning and management of schools by the rural communities themselves.

II

RURAL SITUATIONS

Proposals for action in the area of rural development have to be evaluated against the realities of the rural situation. This is a complex procedure because the principal feature of rural situations is the existence of immense variations with resultant individuality.

The factors (Annex II) creating this vast range of variations can be outlined briefly, as follows:

(a) Physical: geo-climatic factors are probably the most important in that their effect on agricultural production patterns is extreme. Various classifications can occur; for example, Trewatha's "Introduction to Climate"1/ splits the world into eleven principal crop-producing regions, which in turn can be refined into sub-regions (the USA covers portions of two regions and is broken down into 29 sub-regions).

1/ Trewatha, Glenn T., Introduction to Climate, 1968, McGraw, N.Y.

(b) Economic and Social: social includes traditional life styles (nomadic/ sedentary, etc.) religion, land inheritance patterns, traditional feeding habits; economic factors such as availability of communications and markets at the micro-level, prospects for cash crops on international markets at the macro-level, national price structures and landowner/tenant structures. Political factors, whether traditional (tribal or class structures) or modern (agrarian reform or social restructuring) can also influence particular rural situations.

An actual rural situation that occurs as the resultant of the inter-play of these factors is necessarily unique, and, in many cases, considerable local inter-disciplinary research may be needed to clarify and determine the exact inter-play of the varied factors within the milieu before actions can be suggested. (Pending such detailed research, it is often the local farmers who best know the realities of the situation).

The basic and most important point to be considered in any rural developmental activity is the effect of the action on the rural dweller. While not all rural dwellers are farmers, a considerable majority of them are, and profitable increased agricultural productivity provides the main impetus for rural development under either of the two approaches mentioned in Section I.

When considering the farmer, the factors mentioned above indicate the framework within which the individual farmer lives and operates, and illustrates both the limitations on increasing production and also the possibilities for development.

If land is taken as an example of a component of the framework, zones of land-hunger can exist wherein the population pressures on available land make the available plots so small that a farmer cannot manage to produce enough food for the subsistence of his family. Land inheritance patterns can also lead to the farmer's total land area being made up of a series of geographically dispersed, very small plots - thus producing complex management problems.

Cases[1] also often occur in developmental patterns where it becomes impossible for a farmer with only a small area of land to obtain basic living standards comparable to the national living standards. In such cases, two actions are possible: (a) if employment in other sectors is available, the farmer may have to leave the land; or (b) the farmer or his family have to find sources for the accumulation of off-farm income.

Questions of land allocation and land ownership (in certain areas tenants may have to hand over 50 per cent of the crop they produce to the landowners) lie directly in the area of political action - agrarian, or land reform, cooperative policies and farm consolidation, are examples - while questions of land improvement, such as the provision of irrigation systems or changes in land use (from bush fallows and shifting cultivation patterns to block farming and crop rotations) normally[2] also require actions to be taken "from the outside".

1/ e.g. where land reform is not feasible due to lack of availability of suitable land for distribution.

2/ Exceptions can occur where local actions can stimulate land reform, or community action can produce indigenous irrigation schemes, but such exceptions are rare.

The economic environment under which the farmer works is another variable factor, with marketing possibilities and credit availability playing major roles. A geographically dispersed farm pattern coupled with low individual production for sale, even when roads are available, can make the collection of these small quantities uneconomic. Cash export crop production, even if highly developed, can be very much at the mercy of the climate of the international market (although these conditions can be buffered, to a certain degree, by national marketing board policies). Credit availability is often a key factor when innovations are introduced "from the outside" through technological advance. Fertilizers and improved seeds lead to large increases in farm income, but working capital is needed to purchase these commodities; good marketing procedures are often based on periods of crop shortage, but, in the meantime, the farmer needs credit to meet his outgoings.

Social factors provide another aspect of the framework under which a farmer works. Communal grazing patterns, for example, prevent an individual from attempting to improve his livestock; bride price indicated by head of cattle usually places a social, rather than an economic value on livestock production. Social patterns may also determine which crops can be grown, or dictate a fixed farming calendar. Community attitudes towards family planning and food consumption patterns also play a role in determining farm family size and nutritional standards.

III

MECHANISMS OF RURAL DEVELOPMENT

As illustrated in the previous section, the complex multi-factor background to specific rural situations results in extremes of individuality. A discussion on mechanisms in general can, therefore, only be broad in nature. This section will be based on a discussion of series of points of principle which can, in turn, be applied to individual specific situations.

The first point to be discussed is the mechanisms of agricultural production:

In the case of a small farmer at a low level of economic activity or subsistence level, using a traditional system of agricultural production investigation will normally show that he has already optimised existing inputs - a result of the experience of generations of practical farmers. Little can be done through technical advice alone to increase production, while retaining the existing inputs, i.e. soil type, crop varieties, management methods, etc. In other words, practically full potential has already been achieved and very little "slack" or margin for increase exists in such situations.

This case is quite common. It means, in practice, that pure knowledge-type inputs, such as agricultural extension, or related activities cannot be beneficial until other inputs are introduced which create changes in the overall framework, under which the farming activities take place.

Under these conditions, break-throughs in agricultural productivity are normally only achieved by actions from sources outside the traditional farming structures, which result in changes in the existing framework of internal factors.

For the purposes of discussion it is easier to break into two groups the factors operating within a rural situation:

(a) "internal" or inherent factors constituting the traditional framework, and
(b) "external" factors consisting of the introduction of elements of change modifying the traditional structures which, in the majority of cases, are factors introduced from external sources.

Break-throughs in agricultural productivity can, therefore, be related to external-type inputs, for example, a government-sponsored irrigation scheme, the reallocation of land resources under an agrarian reform movement or the introduction of improved higher yielding crop varieties as the result of investment in agricultural research. These are examples of external factor inputs which can change the framework within which production is to be achieved.

Technological inputs, as listed above, are not the only types of external inputs able to create change in frameworks. Economic areas of the framework can also be changed by external influences - urban development, for example, can create new markets for farm crops while new roads can stimulate commercial-type farming activities.

The basic point, however, is that external factor-type inputs are normally required to stimulate rural development. Once the framework under which production takes place is changed by these introductions, then the "slack" in the now modified system becomes considerable. There is then considerable chance of difference in efficiencies between a farmer who, say, uses improved crop varieties and fertilizers, and his neighbour who retains traditional methods and outlooks.

It is only when considerable "slack" or margin for increase in productivity is available, that knowledge inputs of a technical nature (occupational training, agricultural extension activities) can usefully be employed.

One of the dangers of the "integrated" approach to rural development is a tendency to neglect that fact that changes within the framework are essential prerequisites for development, and that without a modification of the most limiting factor operating within the framework, little development is possible.

Take for example a mountain-type rural zone in a rapidly industrializing country with moderate per capita income, where the standard size of a farm holding lies between 0.2 and 0.4 hectares, where the crops grown are fruit trees and some cereals, and a few household livestock are kept, where the average size of the farm family is seven persons, the local schools give an academic type education, and no agricultural extension service exists. An integrated approach in this type of situation would possibly provide agricultural extension services, train the farmers to look after their fruit trees better, provide improved cereal seeds and possibly subsidize fertilizers, change the school curriculum and provide family planning advice.

This type of approach, however, ignores the vital limiting factor of the small size of the farm. Even with the best advice and techniques, it is doubtful whether the income to be gained and the standard of living reached will approach the national average. The best possible basic action is, therefore, that of providing sources of off-farm income by, for example, establishing a light industry in the area. Once a decision has been made on this, the effect of the small size of the holding on farm family income diminishes, and other actions can then be linked, e.g. family planning and improved agricultural practices.

It is suggested, then, that the concept of the connection of complementary actions to a vital motor-type action designed to remove or modify a basic limiting factor, presents a sounder mechanism for development than the integrated approach.

The acceptance of such a concept means that considerable local investigation and research is required as a prerequisite to the identification of the principal limiting factor in the productive (developmental) framework.

It may also mean that a new look is needed at planning techniques and organization. Current planning techniques have fundamentally arisen from industrial society backgrounds and their tendency is towards directional[1] approaches. The rural situation, with its complex inter-factor background and inherent variabilities, may not be suited to such directional thinking. This is particularly true if the approach of self-generating type rural development is used. Possibly, a method of "circular"[2] planning could be developed for rural development based on the principle of continuously balancing multi-objectives, wherein the priority objective is the question of maintaining balance so ensuring a "synthesis" of objectives.

1/ Planning based on production increases.

2/ Circular Planning - planning based on the objective of achievement of the harmonious development of a community based on techniques of continued monitoring and redressing, towards balance, of all factors involved in community life and activities. Two references which hint at this concept, the first directly, the second by inference, are as follows:-

(a) Transfer of a Development Program to Africa: The Case of the Antigonish Movement, Society for International Development, IDR/Focus: Technical Cooperation, 1976/1 p.12.
"Essentially the strategy rested on a particular concept of under-development not as a linear, but as a circular process."

(b) The Design of Rural Development: Lessons from Africa, Uma Lele, a World Bank Research Publication, 1975, p.178.
"The approach recommended in this study involves beginning programs with only the few simplest interventions to remove the most critical restraints, and allows the program to evolve in scope through time-phasing of activities. Program evolution ought to be based on the specific knowledge acquired: the constraints identified, and the indigenous human, institutional, and financial capability developed during the course of earlier stages of program implementation."

KNOWLEDGE INPUTS

This section does not attempt to present a comprehensive review of the role of education in rural development. Its purpose is to comment on certain elements which it is felt are sometimes overlooked or not sufficiently emphasized in current educational literature and studies.

(i) Achievement of Equity

The question of how to obtain a "fair deal" for the rural population is basic to any consideration of rural development. In many cases, urban development continues at a considerable rate and is often supported through investment of funds earned by the rural sector.

How is it possible, within a national framework, to obtain a better and more equitable balance between urban and rural development, so avoiding discrimination against rural populations in resource allocation? To achieve this end it is necessary for the rural population to have a power base, and a developed capability for directed action so that needed inputs can be acquired, and a more equitable allocation of resources obtained.

Thus, it would appear that rural dwellers need to have a strong group of spokesmen at higher levels of administration and policy-making. To be effective, such spokesmen or leaders must be of the intellectual level and sophistication at least equal to that of those leaders representing urban dwellers.

Under present conditions, these kinds of qualities are usually derived from formal education. A case could therefore, on the face of it, be made for giving priority to formal education in rural areas - a prerequisite for getting sufficient people to the top. The required policy and attitude changes would thus be obtained and could lead to more resources being devoted to rural areas.

If rural development is viewed from the angle of "self-development" the above point is of particular significance because, although self-development can start from a methodology of rural or farmers' associations and similar cooperative actions, such a process is difficult to continue without the addition of new external-type inputs leading to factor changes in production frameworks.

To gain these needed inputs the rural population requires both a power base and a developed capability of directed action. Intellectual capacity can provide these and also ensure that the wants of the rural population can be clearly expressed and put forward in national forums of policy decision-making.

(ii) Importance of Research

The multi-factor base of rural activities and the resultant wide individuality of situations means that research often has to operate at micro-levels. Considering agricultural production, there are reasonably large areas of the world wherein geo-climatic conditions are, to a certain degree, standard, and allow for a wide distribution of a particular crop.

The main world example of such a crop is wheat, and during the past decade spectacular regional increases in production have been achieved through the use of modern technology (plant breeding, plus fertilizers). However, as explained in Annex III, such an example constitutes an exception within the overall agricultural production framework. In general terms, such direct technological transfer is not normally possible, and research is required to meet the needs of each separate ecological sub-region.

The development of national systems of agricultural research (coupled with socio-economic research and investigation) constitutes an extremely important part of any rural development strategy.

The table (presented as Annex IV) shows very wide discrepancies between the resources devoted to agricultural research, especially between developed and developing countries of the world. Distortion also occurs between the amount of resources allocated to research compared with resources allocated to agricultural extension activities.

Logical strategies for developing countries would be, firstly, to concentrate on agricultural research, and, secondly, once meaningful results (in terms of potential for increasing productivity) are achieved, to extend the results to farmers.

In reality (see Annex IV for full details) the opposite appears to have occured, as the following ratios illustrate:-

Research expenditure to extension expenditure:

Developed countries	100:57
Developing countries	100:111

Scientific manpower (agricultural research) to extension manpower:

Developed countries	100:177
Developing countries	100:760

A possible reason for the discrepancy could be the lack of available scientific manpower in developing countries. Another reason might be that it is easier to establish an extension service than to set up a network of agricultural research.

In this respect, it was unfortunate that in the late 1950's and early 1960's many aid agencies put considerable stress on the establishment of agricultural extension services, and it took some time for it to be realized that the research base of many countries was not sufficiently advanced to provide extension services with information of developmental[1/] value to extend to the local farmer.

1/ In some cases agricultural research stations obtained yield results far higher than local farmers, but it was not realized that testing under actual farming conditions was needed. Also, often not enough attention was paid to economic factors (costs of inputs, etc.).

From the educational viewpoint, it is important to take the status of agricultural research into account, especially when proposing schemes for rural education which are based on agricultural improvement. For until the knowledge base for increasing agricultural production within a locality is available (i.e. practical results of agricultural research), the teachers will have none or very little worthwhile material to base their teaching on.

(iii) Strategies for Knowledge Inputs

A simple classification of knowledge inputs can be made as follows: (a) inputs designed to increase technical knowledge and to assist in the improvement of the occupational achievements of the recipient; (b) inputs based on more general education and directed towards intellectual development.

Strategies for knowledge inputs into rural areas are dependent on the mixture, or balance, between these two elements of knowledge inputs and also on the timing of feed-in. This concept may be better explained by means of an example.

Take an isolated rural community which is operating at a subsistence or low income level, where no plans exist to change the production framework but it is felt that an investment in knowledge inputs is justified on equity grounds. What is the most efficient form of knowledge input under such circumstances?

As Section III shows, the productive systems of a rural community of the type under examination have little slack. In other words, the community, as a result of generations of experience, has probably reached almost total efficiency within the traditional framework. As in our example no external inputs other than those of a knowledge type are to be introduced, the traditional framework for production will remain.

The following conclusions can therefore be drawn. In the example under consideration, the case for the introduction of technical knowledge (agricultural extension service, agricultural education) without any physical inputs is not strong and will result in little benefit, because of the lack of "slack" available in the productive system.

In this case, the introduction of general education is considerably stronger. General education can be viewed as part of a long-term process of building up intellectual capacity within the community. Such intellectual capacity will be valuable for future productive use when changes come along (through the introduction of other external factors) to modify and re-structure the productive framework.

To illustrate this last point: if the rural community has had primary education for a number of years before an irrigation scheme is introduced (resulting in higher slack in the productive system and more scope for production increases) the intellectual capacity that has been built up through general education can come directly into functional productivity. People in the community will be able to read and write and communication of technical knowledge will be easier, so that posters and leaflets can be used for teaching purposes.

As a general rule, in rural development, starting with communities which are at a subsistence or low income level, it would appear that general education should come first, and that technical type education or occupational training should come at a later stage. This technical knowledge input will need to be closely synchronized with the introduction of external inputs such as irrigation schemes, technological advances coming from agricultural research, improved markets, etc.

(iv) Extension, Occupational Training and Other Technical Knowledge Inputs

Three minor comments are made on these elements:

(i) There is always a need to take into account a simple fact, namely, that the ultimate value of any occupational type education input is necessarily dependent on having something worthwhile to teach. As has been explained earlier, situations often exist in the agricultural area where, due to existing local conditions, there is not much of any direct practical value to development that can be taught. Research in such cases ought to have the priority resource allocation.

(ii) Rural situations do not always, or necessarily, demand purely agricultural types of education. Land may be restricted and the development of other sources of income (off-farm income sources) may be required to enable improvements to be made in the quality of life. Development also often means that more artisans are needed in rural areas (electricians, water supply technicians, bookkeepers, etc.). Occupational training schemes should be based on a broader spectrum of probable requirements, and not restricted merely to agricultural needs.

(iii) The establishment of an agricultural extension service is not the only, or in many cases the best, method of transferring technical knowledge to farmers. The effectiveness of agricultural extension schemes has varied greatly in developing countries. An examination of results usually indicates that it is often a question of whether the service has anything worthwhile to extend.

Agricultural extension services produce problems; in many cases they become bureaucratic and tend to be divorced from rural communities. In some cases salaries of field agents are at least ten times higher than the income of those of the persons advised, and so the overall costs of the extension service weighted against possible increases in production become extreme.

Good agricultural research is a basic necessity; after that all methods of getting information to the farmer should be examined. Farmers' associations can form links with research; literate local community leaders can convey information and advice; the radio can also be very useful. Such methods help to avoid some of the problems that have arisen from the extension services approaches.

POSSIBLE ACTIONS

In global terms it is apparent that there are three broad areas where investment can be usefully applied to assist rural development. These areas are:

(i) Investment in increased and improved general education for rural areas; (ii) investment in research; (iii) investment in mechanisms, through which rural people can express their wants. These choices are based, in summary, on:

(i) Role of Education

Problems of education in a rural area cannot be considered in isolation from national patterns of education. While different educational techniques may be used under rural and urban conditions, a dichotomy of a national educational system into "rural education" as against "education" will probably not meet the wants of rural people whose main requirement is usually to obtain the opportunity for a standard of living and quality of life equivalent to that which they conceive as being available under urban conditions.

In the present situation of the modernization of society, where educational status often correlates closely with financial and social reward, the ideal educational system should be one of having no barriers to prevent a rural child from subsequently reaching a level of financial, social or intellectual status equal to that of an urban child of similar ability and aptitude.

Educational development in rural areas should, therefore, be viewed within the perspective of national educational development, and be based on the principle of equality of educational opportunity.

If, for example, national primary education policy is to adapt such education to the local environment, then special techniques should be developed to do this both under rural and urban conditions. Similarly, with non-formal education schemes for out-of-school growth, it is possible to foresee very different programmes between urban areas and rural ones. However, in principle it would appear wrong, for example, to propose shortened cycle primary schooling for rural areas alone, while leaving urban areas on a full cycle basis.

It must, however, be accepted that considerable problems exist in bringing any type of educational inputs to a rural area. In general terms, in urban society the population is concentrated, whereas in rural areas the population tends to be dispersed. Furthermore, rural areas are often discriminated against, both in terms of social and economic investment.

The dispersed nature of the rural population tends to disperse the social demand and political pressures which are necessary to avoid discrimination and obtain needed investment. In general terms, therefore, the starting base for educational development in rural areas lags behind that of urban areas. Because of this lag effect, it becomes necessary to propose rapid "ad hoc" projects to fortify education inputs for rural areas.

General education, considered as a major contributor to intellectual development, is a vital element in all rural developmental processes. Any discrimination against rural people within national educational development policies and plans thus constitutes a restraint on rural development. A worldwide awareness of the principles of equity and application of such principles could provide a major thrust for global rural development. The role of education in promoting equity should therefore not be neglected or overlooked.

(ii) Role of Research

As had been outlined in Section IV, research needs for rural development are considerable. Research can be divided into the following categories:

(a) investigations of actual rural situations;

(b) research directed at increased agricultural production;

(c) adaptive research - how to adapt results of research, or already developed technology, to specific rural situations.

Both the first and last of these categories imply a large degree of interdisciplinary work including science, economics and sociology.

The global dimensions of these needs in terms of investment also require further investigation. Annex IV of this paper shows in a crude fashion the discrepancies in amounts invested in agricultural research in developed and developing countries. While it is possible to allow some spin-off from research results of developed countries to supplement results obtained in developing zones, the variations of individual rural situations mean that adaptive research will always be required before such results can be beneficially applied.

The development of the higher level manpower needed to meet the needs of research complements comments previously made in this paper on the need to strengthen intellectual capacity within rural areas (more education).

A further field for examination concerns mechanisms for research, and the ways in which maximum utilization of human resources can be obtained. (See Annex I). In the main, however, it is apparent that far more investment is needed in the research component for rural development.

(iii) Expression of Wants of Rural People

Despite the greater awareness currently existing in the world of the pressing need for a more equitable approach to development, it is often not possible, in practical terms, to get effective changes made in resource allocation without a change in power structures. Paternalistic approaches to rural development are commonplace. Real worthwhile approaches can only come into being if rural communities actively participate in determining how national resources are to be divided and allocated.

Such a power shift at higher levels of government administration is more likely if the rural sector itself has power, but to be effective the power has to be accompanied by an intellectual strength competent both to manage power and use

it to correct discriminatory trends. In other words, mechanisms have to be developed through which the rural population can express its wants in both a coherent and forceful fashion.

Under present day conditions the levels and qualities of intellectual strength required to fulfil such a task are generated mainly through formal education. A case can therefore be made for giving priority in rural areas to formal education - a prerequisite for getting sufficient people to the top - which would ensure the attitude and policy changes needed for more resources to be devoted to rural areas.

Further consideration, however, needs to be given to the problems of direction of rural development. Is it possible, for example, to pre-suppose that all future rural development will follow the pattern of urban growth, leading to increased markets for agricultural products? Or is it possible to foresee a type of rural development that does not involve massive urbanisation? For example, if a self-development approach (see Section I) is chosen for rural development leading to a situation of economy based on conservation of stock rather than on maximization of throughput, where rates of production and consumption remain low and wherein serious attempts are made to equate wants and needs, then it would appear that serious attempts to redefine planning theories and planning techniques are urgently required.

Current planning approaches remain transfers from an industrial-biased society. They need either to be comprehensively adapted as a minimum, or to be redeveloped from basic principles. (See Section III). Intellectual investment into such a rethinking of planning mechanisms could provide a worthwhile contribution to worldwide rural developmental processes.

RESEARCH AND HIGHER EDUCATION - A SUGGESTION FOR RURAL AREAS

This Annex outlines a "model" wherein the needs for increased investment in research, as a precursor for rural development, can be coupled with a concept of the development of intellectual power in rural areas.

From the viewpoint of agricultural development - taking an example of a research and economic breakthrough in livestock production, and allowing for a production method based on high application of modern technologies - the specialist producer will need a high level of technological background in such areas as animal nutrition, animal breeding, marketing and, possibly, electronics and mechanics.

In order to train a producer, planner or advisor, in the most up-to-date, precise, quickest and economic fashion, it would seem simplest to train him/her within the Research and Development Centre where these technologies have been developed, rather than to create a separate "training" institute with expensive equipment and specialized staff. The latter would mean a duplication of resources and thus an unnecessary duplication of expensive investment and scarce manpower.

The base for the "model" is thus a series of research and development units related to rural development requirements on to which training, based on local requirements, is added. This is an opposite approach to that found in university development, where education and training form the main central focus with research, and sometimes development, added as a secondary feature. It is obvious, however, that merely to add a training aspect to research and development would not in itself be sufficient.

If, for example, a person joins one of these research, development and training units, he or she may find himself/herself lacking in a knowledge of basic sciences and so be unable to make progress in his/her training activities, due to a lack of understanding of underlying scientific concepts.

A source has thus to be added to the structure to allow both for topping up of previous education, in step with training requirements, and satisfaction of personal intellectual requirements. The "model" thus proposes a central core to which students and research workers could come from the outer ring of research, development and training units.

An "open" structure is another feature of the model: for example, if one considers the research and development unit, it is easy to see that training can be done at various levels. At the lowest level, specialist laboratory technicians can be trained; at the middle level, technological managers; and at the top level, specialist research workers. Thus the system can be considered as a cone with entry and exit points at various levels.

Again the central core can also be considered as a cone structure with a variety of inlet and outlet levels and could include the following areas: (i) science and applied sciences; (ii) economic and social studies; (iii) cultural activities and fine arts; (iv) literature, history and languages. Thus besides

providing support to the outer ring of satellite R, D and T units, the common core could act as an intellectual centre for the whole population of the region and as a type of community college for adults, so helping to conserve rural cultures.

The model thus avoids unnecessary duplication of resources between research and training, provides an open and less restricted source of higher learning than a traditional university structure, and helps to actively meet the intellectual wants of rural populations. The multi-disciplinary nature of such an institute ensures that resources for the development of planning mechanisms are broad, and simultaneously the training aspects allow for the production of both additional planning and research manpower.

Detailed Description

A series of Research and Development Centres, coupled with a mechanism (Core Education Unit) for furthering educational knowledge and intellectual growth, could form a unity termed as an "Institute of Research, Development and Higher Learning" which would provide rural regions with a strong intellectual centre and a development aid (research and planning activities).

Such an Institute would have many functional similarities to a university, but it would be both more open and more keyed to regional development than the traditional form of university and would provide training and education at more varied levels.

A Higher Institute would be made up of two elements: Research, Development and Training Centres (to be referred to in the text as "R, D and T centres"), and a Core Education Unit. An example might illustrate the interplay between the two: in "Y" there might be such a new institute, and all of its R, D and T centres would be adapted principally to local needs and resources. One such research centre, therefore, might be specialized in horticulture and irrigation, another in agricultural processing industries, another possibly in socio-economic development. In such centres, research activities would be essentially aimed at the solution of specific development problems. The training would in fact take place as part of the applied research programme. The research programme would be derived from concrete requirements for performance, covered by contracts with the public or private sector.

Pursuing the illustration, a graduate of a secondary school would not have to take entrance examinations but would be authorized to enter an R, D and T centre at a level based on his past performance on a working (apprenticeship) basis. The participant would also need to broaden his knowledge background through studies at the general Core Education Unit. The Core Education Unit would not provide exact specialization in the R, D and T field, but would supplement the participant's general educational background with appropriate and more detailed studies, at higher levels, in subjects fundamental to the applied research activities in which he or she is engaged. Entrance into the Core Education Unit would thus take place not only at the beginning of the process, but would be continuous as the participant moves up through the applied research process and would be on a part-time basis.

Core Education Units, besides providing educational support services to the training component of the R, D and T centres, could also act as a type of "community college" for local adults. They could run informal courses designed for life-long education. Such courses would not be particularly job-oriented but would be of a cultural or leisure activity type.

The Core Education Unit would thus consist of sections based on specific academic disciplines, but course structures would be extremely flexible to allow entrants to choose their appropriate needs and so support their work requirements within the R, D and T centres.

Each section of the Core Education Unit would also be required to provide extra-mural type courses, not job-oriented but designed to meet the cultural and knowledge wants of the surrounding adult population, thus helping to provide the rural community with a source for life-long education.

All students in this Higher Institute would thus have to fit into one of the R, D and T centres. Anyone entering such a centre and not being capable of handling his work properly would automatically be dismissed, just as he would be if he were to enter a real job situation. This would be relatively easy to achieve since the educational situation in the institutes would be essentially production-oriented and based on achievement. Hence, there would be no need for a formal examination programme at the beginning. Everyone would be given a chance to fit into team work and would be allowed, if his skills, competence and personal motivation are of sufficient level, to follow up this programme with additional training.

Anyone entering an R, D and T programme might either leave it relatively early after having obtained some sort of certificate, thus being qualified for a specific job (say as a laboratory technician or junior extension worker), or might wish to continue and, after additional training, leave at a slightly superior stage. It is conceivable that, for example, a junior extension worker already trained and already at work might enter the Higher Institute at a fairly higher stage in the system, and then continue for a few more steps and achieve another certificate qualifying him for a career in agricultural research.

No reference is made to the concept of credits as used in some universities in the industrialized world, as these are usually associated with a given time span. Purposely no reference is made to years of education as these imply by definition a uniform duration. The concept of the new Institutes of Higher Learning does not rely on this premise but rather assumes that, as admittance is based on past performance and experience, entrants can come in at various levels within the system and leave at different higher levels.

However, it would no doubt be possible to evolve a system of equivalence, through which a person leaving the system at a certain level could be considered to have acquired a background of knowledge and intellectual ability equal to that of a person who had proceeded through the more traditional paths of a university degree course. This would thus ensure a direct linkage between an Institute of Research and Higher Learning and a national system of higher learning.

The implementation of such a proposal would be based on two stages: (i) establishment of the research units, as these are a basic necessity for any rural development activity; (ii) adding the central Core Educational Unit and developing the educational and training aspect of the Institute.

It should, however, be noted that the suggestions made above are put forward in a broad context of stimulating thought into new approaches towards research and higher education in rural areas.

Some important questions are probably therefore not covered in sufficient depth, the effect of the suggested mechanisms on the implementation of research activities being a valid example. It should therefore be kept in mind that there are other approaches, including that of a broader scope for agricultural research.

A common feature in developing countries is the low proportion of research results applied to the farm and the failure to recognize that the problem may not be, to a large extent, either scientific or technological, but that the main barriers for their application are found in organizational, administrative, institutional, social and economic factors. In fact, not much may be known about existing farming structure and patterns, nor of the implications of the changes called for in agricultural modernization and development. There can be an almost total absence of research programmes on basic sociological and economic factors related to these aspects. Broadening the scope of agricultural research by a modern university (agricultural, rural, etc.) through its various departments and interlinked disciplines would have a great deal to offer in this respect.

EXAMPLE OF FACTORS

List of maps presented in H.R.J. Davies, Tropical Africa - An Atlas for Rural Development, University of Wales Press, 1973.

Physical

Relief
Rainfall
Precipitation Effectiveness
Inherent Soil Fertility
Vegetation

Social

Major Ethnic Groups
Lines of Descent (patrilineal, matrilineal, mixed and other)
Traditional Ways of Life (agriculture, pastoralism, fishing, etc.)
Rural Settlement (settlement patterns and types)

Modernization of Society

Gross National Product
Energy Consumption
Commercial Vehicles
Education
Agricultural Employment
Minerals
Exports (per capita)
Exports (by specified classes)

Communications

Communications (road, railways, waterways)

Urban Growth

Urban Areas
Urbanization (rate)

Political

Political 1971
Colonial Era
Independence

Population

Population Density

Cattle

Cattle: Ratio to Population
Cattle: Density

Subsistence Agriculture

Dominant Subsistence Crops (area)
Cereals and Roots (production)
Sorghum and Millets (production)
Maize (production)
Yams and Sweet Potatoes (production)
Manioc (production)
Bananas, Plantains and Ensete (production)

Cash Crops

Dominant Cash Crops (by area)
Oil Palm (production)
Cocoa (production)
Coffee (production)
Cotton (production)
Ground Nuts (production)
Cash Crop Summary (production)

The above-mentioned study covers a large area - Tropical Africa - at a micro-level. It would be possible and necessary to increase the number of factors that would have to be taken into account during rural development studies.

ANNEX III

BACKGROUND

The paragraphs below from the 1969 Annual Report of the International Rice Research Institute illustrate clearly that in a large number of cases it is impossible for individual farmers, whether educated or not, whether informed by extension activities or by non-formal methods, to increase production under their existing environmental and economic conditions.

"In both absolute and relative terms, the new wheat varieties have been spreading more rapidly than rice. The dwarf wheat varieties have been concentrated in India, Pakistan, and Turkey. From their introduction in 1965/66, they have spread to more than 7 million hectares, or over 20 per cent, of the Asian wheat area. This can be compared with the 4.7 million hectares, or 6 per cent of the Asian rice area planted to new varieties.

Many reasons are given for this difference. For example, some observers say that the new rice varieties require a higher level of management skill from farmers. Available data suggest, however, that the difference results mainly from the environmental conditions under which the two crops are grown and not from the cultivation problems. Environment refers not only to climate and soil, but also to irrigation facilities, factors over which farmers have very little control. Although the influence of physical environment cannot easily be separated from social and cultural conditions, we contend that the major obstacle to the spread of the new rice varieties has not been poor farm management, lack of farmer knowledge, nor inadequate extension. Under favourable environmental conditions, the potential of the new rice varieties equals or exceeds that of wheat, but most farmers grow rice under typical monsoon Asian conditions. Thus they face a more variable yield response to inputs and a higher risk.

The new Mexican wheat varieties are grown mainly in the relatively homogeneous area of northern India and West Pakistan. This area has a dry climate, fertile soils, and adequate underground water supplies. Before the new varieties were introduced, regions such as the Punjab were already showing marked growth in agricultural production. The new varieties are concentrated on irrigated lands, which make up approximately two-thirds of the wheat area. In these areas, farmers have often doubled their yields.

West Pakistan is the most favourable rice-growing area in Asia. Here, rice, like wheat, is grown under a dry climate with adequate underground water supplies close to the surface. The 1.5 million hectares of rice in West Pakistan (only one-eighth of the area of Pakistan), however, represent a tiny fraction of the rice area of Asia.

In Asia, rice is usually grown in regions with high seasonal rainfall where good water control is absent and water supply is uncertain. Only 20 per cent of the rice area is irrigated. Much of the irrigation is done with diversion dam systems, so even the irrigated area is not free from floods and droughts.

ANNEX III

The new varieties are not suited to the deep-water conditions in the large flood plains of South Vietnam, central Thailand, East Pakistan, and lower Burma. In rainfed and upland areas, the new varieties perform at least as well as local varieties. The potential differences in yield are far less, however. In much of this area, uncertain rainfall conditions cause farmers to limit the use of fertilizers and other cash inputs.

The high humidity during the main growing season is another environmental problem for rice. Humidity increases the severity of attacks by insects and diseases. The susceptibility of IR8 to insects and diseases has been largely responsible for the lack of success in attempts to introduce it into East Pakistan, Malaysia and Indonesia."1/

1/ Annual Report of the International Rice Research Institute, Los Banyos, Manila, Philippines, 1969.

ANNEX IV

AGRICULTURAL RESEARCH AND EXTENSION
1965 INTER-REGIONAL COMPARISONS 1/

Region	Expenditure on Research (million $)	Scientist Man-Years	Expenditure on Extension (million $)	Number of Extension Workers
North America	390.2	15,283	204.4	9,137
Northern Europe	190.0	8,232	106.4	17,480
Southern Europe	23.1	2,236	25.1	5,335
Oceania, South Africa, Rhodesia	86.7	3,671	(43.0)	(7,950)
Eastern Europe and USSR	(233.2)	15,340	(144.0)	(33,400)
Latin America	20.6	2,431	22.9	3,883
Middle East and North Africa	33.3	1,608	(33.0)	(15,500)
South and South-East Asia	36.0	4,220	(45.9)	38,892
East Asia	65.7	5,195	47.4	18,443
Sub-Sahara Africa	33.5	1,344	28.0	23,820
Developed Countries	985.7	49,262	559.2	87,428
Less Developed Countries	126.6	10,298	140.9	76,412
World Total	1,112.3	59,560	700.1	163,840

This table shows that on 1965 data the balance between research expenditure and extension expenditure was 1:0.57 in developed countries but only 1:1.11 in less developed countries. In terms of manpower utilized the figures are more extreme, 1:1.77 compared to 1:7.6.

1/ Source: Robert Evenson, Research Extension and Schooling, World Yearbook of Education, 1974.

Note: Brackets indicate estimates.

8

IDENTIFICATION AND PREPARATION OF EDUCATIONAL DEVELOPMENT PROJECTS

by

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IDENTIFICATION AND PREPARATION OF EDUCATIONAL DEVELOPMENT PROJECTS

Introduction

From an operational point of view, educational development plans can be considered as collections of large numbers of projects or potential projects. Indeed, since the implementation of an educational development plan necessarily is carried out in discrete operational components, the degree to which a plan has been formulated in terms of projects is one measure of the practical relevance of the plan. In developing countries, this aspect to educational planning is especially salient because the educational administrations in developing countries have an interest in facilitating and increasing the flow of external financial support, which, regardless of source, is disbursed mainly against individual projects.

Professional discussion about educational planning, however, has not hitherto developed a focus on the identification, preparation and appraisal of educational development projects. This contrasts with other areas of development planning and with professional discussion among economists, for example, about industrial, agricultural, transport, and power projects.1/ The emphasis mainly has been on identifying rules for overall system integration, so that analysis of the process of defining and elaborating system components has been relatively neglected. Plans require projects, so to speak, as much as projects require plans. However, it may be the case that the details of particular educational development projects usually are set out only in internal government documents, so that there is not widely available to professional social scientists in general, or to working educational planners outside their own national administrations, a body of case material.

These considerations give a special interest to the work carried out by the Unesco Secretariat's Education Sector under the Cooperative Agreement between Unesco and the World Bank in assisting governments to identify and prepare educational development projects for external assistance, in particular by the Bank.2/ The latter is by far the largest single source of external aid to education in developing countries; its financial assistance to education is disbursed almost entirely against particular projects; two-thirds or more of the projects in recent years have involved Unesco's assistance in their identification and preparation; and many of the projects are implemented with technical assistance provided under the auspices of Unesco. Thus, even a brief examination of the process of identifying and preparing projects with Unesco's assistance under the Cooperative Agreement might contribute towards generating a wider interest in the 'projects' aspect to educational planning.

1/ For example: UNIDO, Guidelines for Project Evaluation, United Nations, New York, 1972; and OECD, Manual of Industrial Project Analysis for Developing Countries, OECD Development Centre, Paris, 1968.

2/ Within the Education Sector, it is the prime responsibility of the Division of Educational Financing to fulfill these functions.

The paper is in four parts: (i) an outline of the project cycle; (ii) an overview of the projects recommended by Unesco project identification missions 1965-1975; (iii) a follow-up of these projects through to appraisal by the Bank; and (iv) a preliminary analysis of the economic parameters underlying the identification and appraisal processes.

The Project Cycle

The entire process of first identifying the initial dimensions of an educational development project (for example, to establish a new teacher training college), followed by a decision to prepare a formulation of the project in detail, followed by the preparation exercise itself, then an appraisal of the project as it emerges from the preparation exercise and a decision on whether to implement the project, and if the decision is favourable with or without modification to the prepared project, then the actual implementation of the project itself, can be considered as a cycle of activity. Essentially, the project cycle has four stages: identification, preparation, appraisal and implementation. At any particular time the ongoing operations of a typical educational administration, such as a government ministry, can be considered as a complex of project cycles, all at different stages of development, together with the administration of completed projects.

When a government is considering the possibility of World Bank assistance for an education project, the Cooperative Agreement between the Bank and Unesco provides for the latter to assist the government in the identification and preparation of the project, leading up to a formal request by the government to the Bank, and often other agencies, to support the project. Following this request, the agencies which have been approached by the government will "appraise" the project and negotiate the level and kind of assistance to be provided. Unesco, of course, except in cases where it is approached directly in its capacity as an aid-agency by the government for assistance to a project, does not participate in the negotiations, which are conducted between the government and the agency (the Bank or another government) concerned. Subsequently, if the government has not had second thoughts about the project, and if one or another of the aid agencies has agreed to provide assistance, it remains to implement the project. Technical assistance for implementing the project frequently is requested from Unesco, but this stage of the project cycle, and also the appraisal stage, are not examined in the present paper.

At the identification stage, priority projects for external assistance are sketched out with preliminary costing and recommended on the basis of their prospective contribution to the country's social and economic development, taking into account the feasibility of the projects and their consistency with the government's development plans as a whole. An important component of the project identification mission's work is to consider the possibility of initiating projects in areas which have priority in the government's plans, say, but which have not yet been formulated operationally in terms of specific projects; this often is the case when new sorts of education or training, of a kind which have not yet been undertaken in the country in question, or which have been undertaken on a very small scale, are given priority.

On receipt of the project identification mission's report, which is addressed to the government with copies to the World Bank, UNDP, and other agencies selected by the government, the latter makes a decision on the projects to be prepared in detail to constitute a formal request for external assistance. The principal purpose of the preparation exercise is to arrive at a fully worked out accurate estimate of project costs, so that there is a definite basis for negotiations between the government and the external aid agency in question. Of course, in order to arrive at an accurate estimate of costs, key decisions about project content, administration and timing have to be taken by the government.

The work involved in the project preparation exercise will vary from country to country and project to project according to how much prior preparation has been done. In cases, say, where a project in the educational development plan has been fully worked out as to content, administration, timing, and costs, there is no reason in principle why a government should not negotiate directly with external assistance agencies immediately the plan is published, without having to go through additional identification and preparation stages. Indeed, one important objective of Unesco assistance to educational planning in developing countries is to help educational administrations in the latter to develop competence and skill at all stages of the project cycle.

Projects Identified 1965-1975

Coverage of Countries

Seventy-four Project Identification Mission (PIM's) reported to 60 different member states under the Cooperative Agreement between Unesco and the World Bank between May 1965 and April 1975. Fourteen countries were covered on two occasions. Two PIM reports (Oman and Spain) were educational sector memoranda without costed project proposals, and one report (Ivory Coast) was a full sector study, also without costed proposals. The project proposals of the remaining 71 PIM's, covering 57 countries, totaled U.S.$ 1.4 billion (Table I). In virtually all cases, the projects covered capital costs (construction, furniture, and equipment) and technical assistance only, since it is not the usual practice for governments to rely on external assistance to support recurrent expenditures or the policy of external agencies to offer such support.

As measured by population size, and also by 1972 GNP per capita (though excluding countries with GNP per capital greater than U.S.$ 1,500 on the grounds that they typically do not request external assistance for education projects), the 57 countries constitute a fair cross-section of all the member states of Unesco. There are over-representations of countries in the population size-group 1 - 4.9 million (Table II), and slight over- and under-representation respectively in the GNP per capita groups U.S.$ 100 - U.S.$ 249 and U.S.$ 250 - U.S.$ 499 (Table III). On the whole, there is a slight bias of coverage towards the smaller countries and also towards the poorer ones.

TABLE I

PIM Education Project Totals by Country 1972-1975 [1]
(US$ million)

1965-1969 [2]		1969-1972 [3]		1972-1975 [4]	
Chad	0.8	Somalia	3.6	Burundi	3.0
Swaziland	3.0	Dahomey	4.8	Mauritania	3.7
Rwanda	4.2	Mali	5.1	Sierra Leone	4.5
Botswana	5.1	C.A.R.	5.2	Yemen, P.D.R.	5.7
Lesotho	6.3	Niger	5.8	Burma	7.1
Dominican Rep.	7.0	Madagascar	5.8	El Salvador	7.3
Iran	9.7	Liberia	6.3	Somalia	8.1
Ecuador	7.8	Honduras	6.7	Barbados	8.9
Congo	8.0	Costa Rica	8.7	Dominican Rep.	10.0
Nicaragua	8.7	Jordan	9.2	Jordan	11.7
Senegal	8.7	Nicaragua	9.9	Syria	14.1
Guatemala	8.9	Lebanon	10.8	Gabon	16.9
Paraguay	8.8	Sri Lanka	12.1	Guatemala	18.0
Taiwan	13.4	Iraq	12.9	Pakistan	18.7
El Salvador	13.6	Turkey	13.6	Ecuador	19.6
Iran	15.0	Malaysia	15.2	Guyana	20.7
Uganda	15.0	Cameroon	18.6	Lebanon	25.7
Bolivia	21.4	Ghana	21.0	Korea	26.9
Korea	22.6	Philippines	22.5	Afghanistan	28.5
Algeria	23.5	Morocco	28.5	Tanzania	29.6
Zambia	37.0	Thailand	34.3	Greece	30.8
Bangladesh [5]	48.7	Pakistan	56.2	Morocco	37.3
Chile	53.5	Peru	65.6	Malaysia	68.2
		Nigeria	137.3	Philippines	90.6
Total	350.7		519.7		515.6
Median	8.9		11.4		15.5
Mean	15.2		21.7		21.5

GRAND TOTAL 1,386.0

Median 11.1

Mean 19.5

Notes:

1/ From the first PIM report in May 1965 up to and including the seventy-fourth in April 1975. Fourteen countries had two PIM's in this period.

2/ May 1965 - July 1969, excluding Spain (February 1969) where potential projects were not costed out.

3/ August 1969 - April 1972.

4/ May 1972 - April 1975, excluding Ivory Coast (August 1973), and Oman (December 1972) where potential projects were not costed out.

5/ Then East Pakistan.

TABLE II

Distribution by Population Size of all Unesco Member States Compared to those Member States Covered by PIM's 1965-1975

(percentages)

Population Size [1] (million)	Member States	PIM's [2]
Less than 1	10	9
1- 4.9	31	40
5- 9.9	18	16
10-14.9	13	16
15-19.9	4	3
20-24.9	4	-
25-29.9	2	2
30-34.9	4	3
35 +	14	11
Total	100	100

Notes: 1/ 1972.

2/ i.e., the 57 different member states for which costed education project proposals were made 1965-1975.

TABLE III

Distribution by GNP per Capita of all Unesco Member States with 1972 GNP per Capita less than US $1,500 Compared to those Member States Covered by PIM's 1965-1975

(percentages)

GNP Per Capita (US $)	Member States	PIM's [1]
Less than 100	16	18
100-249	24	26
250-499	47	42
500-749	7	7
750-999	4	5
1,000-1,249	1	-
1,250-1,499	1	2
Total	100	100

Notes: 1/ i.e. the 57 different member states for which costed education project proposals were made 1965-1975.

As a general rule, the larger projects were in the more populous and more developed countries, reflecting differences both in the sizes of the youth age-groups between countries, and hence the potential target populations for education projects, and also differences between countries in the absorptive capacities of their existing educational systems and administrations. Exceptions to the rule would have arisen according to particular circumstances, such as the overall priority accorded to external assistance for education as distinct from other sectors, the amount of prior identification and project preparation work already done, and the 'lumpiness' of particular projects (e.g. textbook production and reform in the Philippines). However, if the project totals are weighted by population, there was a bias in project size towards the more developed countries: for example, the project totals per unit of population were greater for countries above the median GNP per capita of U.S.$ 260 than for countries below the median (Table IV). This feature, however, was more marked in the earlier periods of the Cooperative Programme than in the later ones: for example, in the period 1972-1975 the project totals per unit of population on average were greater for countries below the median GNP per capita of countries covered during that period.

TABLE IV

Size of PIM Education Project Totals in Relation to Country GNP per Capita (1972) and Population (1972), 1965-1975

Country	GNP per Capita (US$)	Population (millions)	Project Total (US$ m)
	(1)	(2)	(3)
Rwanda	60	3.9	4.2
Bangladesh	70	72.5	48.7
Burundi	70	3.5	3.0
Afghanistan	80	14.9	28.5
Chad	80	3.8	0.8
Mali	80	5.3	5.1
Somalia	80	3.0	5.8
Burma	90	28.9	7.1
Lesotho	90	1.0	6.3
Niger	90	4.3	5.8
Yemen, P.D.R.	100	1.5	5.7
Dahomey	110	2.9	4.8
Sri Lanka	110	13.2	12.1
Tanzania	120	13.6	29.6
Nigeria	130	69.5	137.3
Pakistan	130	66.7	37.4*
Madagascar	140	7.4	4.8
Uganda	150	10.5	15.0
C.A.R.	160	1.7	5.2
Mauritania	180	1.2	3.7
Sierra Leone	190	2.7	4.5
Bolivia	200	5.2	21.4
Cameroon	200	6.1	18.6
Philippines	220	39.0	56.5*
Thailand	220	38.5	34.3
Botswana	240	0.6	5.1
Liberia	250	1.7	6.3
Senegal	260	4.0	8.7
		427.1	526.3
Total of (3) / Total of (2)	= 1.23		

Country	GNP per Capita (US$)	Population (millions)	Project Total (US$ m)
	(1)	(2)	(3)
Swaziland	260	0.4	3.0
Jordan	270	2.5	10.4*
Morocco	270	15.8	32.8*
Congo	300	1.2	8.0
Ghana	300	9.1	21.0
Korea	310	32.4	24.7*
Honduras	320	2.7	6.7
Paraguay	320	2.4	8.8
Syria	320	6.7	14.1
El Salvador	340	3.7	10.4*
Equador	360	6.5	13.7*
Iraq	370	10.1	12.9
Turkey	370	37.0	13.6
Zambia	380	4.5	37.0
Guyana	400	0.8	20.7
Guatemala	420	5.6	13.4*
Algeria	430	14.3	23.5
Malaysia	430	11.5	41.7*
Nicaragua	470	2.2	9.3*
Dominican Rep.	480	4.2	8.5*
Iran	490	31.2	12.4*
Taiwan	490	15.1	13.4
Peru	520	14.1	65.6
Costa Rica	630	1.8	8.7
Lebanon	700	2.9	18.2*
Barbados	800	0.2	8.9
Chile	800	10.0	53.5
Gabon	880	0.5	16.9
Greece	1,460	8.9	30.8
		258.3	560.8
Total of (3) / Total of (2)	= 2.17		

* Signifies that the figure is an average of two project totals.

Levels and Fields of Education and Training

The types of projects identified covered a large variety of different kinds of education and training. At least two-thirds of all the areas specified at the three-digit level of Unesco's International Standard Classification of Education (ISCED) were covered by one or another of the projects. At the first-digit level (Table V), every area was covered except for kindergarten education (Education preceding the First Level), which more appropriately falls in the domain of Unicef:

TABLE V

Classification of Project Items[1] at the ISCED First-Digit Level

ISCED Code[2]		Number of Project Items[3]	Total Cost (US.$ million)
0	Education preceding First Level	-	-
1	Education at the First Level	11	33.3
2	Second Level (1st Stage)	104	371.2
3	Second Level (2nd Stage)	154	374.9
5	Third Level (1st Stage, not equivalent to university degree)	61	129.4
6	Third Level (1st Stage, equivalent to university degree)	66	175.1
7	Third Level (2nd Stage, post-graduate)	2	3.3
9	Education not defined by level	129	159.8
8[4]	Supporting services	116	138.7
Total		643	1,385.7

Notes: 1/ There is a terminological distinction between 'projects' and 'project items', essentially due to the World Bank's practice of referring to a loan covering a disparate group of projects in different fields of education and training, and at different levels, as a single overall 'project' while the various components are referred to as 'project items'. In this paper, 'project items' are identified according as to which cells the 'project' components fall into in the cross-classification adopted in Table VI following.

2/ The coding has empty categories for 4 and 8, so the category 8 is used here for the class of project items called 'supporting services' (see footnote 3 below).

3/ A project item which covers two or more ISCED codes is counted as two or more project items.

4/ This category includes project items for curriculum development, printing and production of educational materials, media services (radio and TV), libraries, educational planning and statistics, etc.

The largest number of project items was identified in 'second level (2nd stage)' education, followed by the category 'not defined by level', which refers roughly to non-formal education and training, then by the category 'supporting services', followed by 'second level (1st stage)' education. As measured by estimated costs, the largest group of project items was the category 'second level (2nd stage)', closely followed by 'second level (1st stage)', and then 'third level' (university degree). The disproportionately low total costs for 'education not defined by level' probably reflects the fact that non-formal education project items, though numerous, inherently are less capital-intensive than project items in the formal system.

The first-digit classification above abstracts, of course, from the educational or training subject-matter field. The latter is taken into account by the last two digits in the ISCED three-digit code. The code identifies 22 different fields. Only four out of the 22 fields were not covered by one or other of the projects: fine arts programmes, religion and theology programmes, law and jurisprudence programmes, and special programmes for the handicapped. Some of the remaining fields (e.g. literacy or engineering programmes) occur only at certain levels, so it will be useful to collapse the list, and at the same time make provision for including the 'supporting services' project items as fields. The training of teachers and instructors also can be classified under 'supporting services'. Nine distinct fields are shown in Table VI.

The fields may be grouped into three broad categories: general education, specialized education, and supporting services (including the training of teachers):

	Number of Project Items	%	Costs (US.$ million)	%
General education	124	(19)	555.9	(40)
Specialized education	300	(47)	475.3	(34)
Supporting services and training of teachers	219	(34)	354.4	(26)
Total	643	(100)	1,385.6	(100)

Nearly half the project items were in specialized education, followed by supporting services with just over a third. However, measured by costs, the general education project items being typically larger than project items in the other categories, account for the biggest share of the total.

Distinguishing by field and level, and measuring either by number or by costs, the largest single group of project items identified was in second-level general education programmes (Table VI).

TABLE VI

Number of Project Items and Costs by Level and Field
(US$ million)

(Number of project items in parentheses)

Field	First Level	Second Level	Third Level	Not Defined By Level	Total
General Education					
1 Literacy, functional literacy, general education, general arts and sciences, social sciences, practical studies in general education	33.3 (11)	449.9 (95)	59.6 (12)	13.1 (6)	555.9 (124)
Specialized Education					
2 Trade, craft and industrial training, technical education, engineering, architecture and town-planning	-	100.6 (56)	116.6 (26)	70.5 (40)	287.7 (122)
3 Agriculture, forestry, fisheries, animal husbandry and veterinary programmes	-	51.6 (48)	34.0 (26)	23.9 (36)	109.5 (110)
4 Health-related, medical and para-medical programmes	-	5.6 (6)	11.0 (6)	0.3 (1)	16.9 (13)
5 Commercial and business accountancy and book-keeping, and management training programmes	-	11.0 (9)	2.8 (3)	20.4 (15)	34.2 (27)
6 Community development, home economics, domestic science, nutrition and family planning programmes	-	4.3 (4)	1.4 (4)	21.3 (20)	27.0 (28)
Supporting Services					
7 Training of teachers and instructors	-	123.1 (40)	82.2 (52)	10.3 (11)	215.6 (103)
8 Curriculum development, libraries, in-service resource centres, printing and production of educational materials, media (radio and TV), etc.	-	-	-	128.6 (71)	128.6 (71)
9 Educational administration, planning, statistics, etc.	-	-	-	10.2 (45)	10.2 (45)
Total	33.3 (11)	746.1 (258)	307.6 (129)	298.6 (245)	1,385.6 (643)

The overall size distributions of projects and project items are shown in Table VII.

TABLE VII

Frequency Distributions of Sizes of Projects and Sizes of Project Items

Projects

Size of Project (US$)	1965-1975
Less than 10 million	.45
10-19.9 million	.24
20-29.9 million	.16
30-39.9 million	.06
40-49.9 million	.01
50 million or more	.09
Total	1.00
n	71
Mean (u) US$ million	19.5

Project Items

Size of Project Item (US$)	1965-69	1969-72	1972-75	Total 1965-75
Less than 1 million	.55	.57	.55	.56
1-1.9 million	.20	.22	.19	.21
2-2.9 million	.11	.09	.08	.09
3-3.9 million	.04	.03	.05	.04
4-4.9 million	.01	.02	.03	.02
5-5.9 million	.02	.01	.02	.02
6-6.9 million	.03	-	.01	.01
7-7.9 million	-	-	.01	-
8-8.9 million	-	.01	.01	.01
9-9.9 million	-	.01	.01	-
10 million or more	.04	.04	.03	.04
Total	1.00	1.00	1.00	1.00
n	158	254	231	643
Mean (u) US$ million	2.2	2.0	2.2	2.2

The coverage identified in Table VI is not necessarily representative of education projects in general in those countries. Probably the most important category under-represented is first-level general education, a category which in most developing countries actually absorbs the largest share of domestic resources devoted to education. One reason for this under-representation is the practice of external agencies of disbursing funds to payment vouchers for work done on a project, a procedure which biases external aid against projects involving assistance to large numbers of small institutions spread among a variety of central and local government jurisdictions, as is the case in primary education. The burden of additional record-keeping and procedures necessary for efficiently processing a highly decentralized multi-institutional externally-assisted project can be carried by few of the fragile educational administrations of developing countries, and external agencies themselves do not have the bureaucratic capacities to provide field assistance.

Leaving aside these, and other,1/ institutional factors influencing the kinds of projects identified under the Unesco/IBRD Cooperative Programme, two classifications are of particular interest from the standpoint of educational planning and comparison with other sectors: (i) classification of the project items by impact characteristics, that is according to the kinds of changes they would effect to the existing provision of education and training services, and (ii) classification according to the kinds of justifications put forward in support of these changes. Under the first classification, the project items can be grouped into three broad categories, according to whether the change in the existing provision of education and training services involved establishing an entirely new kind of service not hitherto provided in the country in question, or whether it involved simply an expansion of some existing service or group of services, or whether it involved a partial modification of an existing service or group of services. Under the second classification, the project items can be grouped into two broad categories, according to whether the proposed justification was mainly an efficiency rationale (e.g. manpower needs, or improved educational administration) or an equity rationale (e.g. universal primary education, or special efforts to enrol women and girls).

Impact Characteristics

Two hundred and twenty out of the total of 643 project items recommended in the PIM reports involved establishing a new kind of institution or service not hitherto provided in the country in question, while another 231 project items involved a modification of an existing institution or service, generally with a view to improving it in some way, and sometimes involving a certain degree of expansion. Project items involving mainly just a straightforward expansion of existing institutions or services numbered 192. As measured by estimated costs, 'new' project items totaled U.S.$ 454 million, 'modification/improvement' project items totaled U.S.$ 470 million, and 'expansion' project items totaled U.S.$ 462 million.

1/ For example, that Bank projects mainly involve the financing of physical facilities and equipment, as distinct from technical assistance or recurrent expenditures.

Nearly two-thirds (138) of the new project items were in the category 'education service not defined by level', though because the items in this category typically were small, the category accounted for only about one-third of the estimated total cost of new project items (Table VIII). The largest proportion of the estimated total cost of new project items was accounted for by 44 second level project items.

TABLE VIII

'New' Project Items by Level and Field
(US$ million)

(Number of Project Items in Parentheses)

Field	First Level	Second Level	Third Level	Not Defined By Level	Total
General Education					
1 Literacy, functional literacy, general education, general arts and sciences, social sciences, practical studies in general education	9.1 (4)	159.6 (18)	14.2 (2)	12.8 (5)	195.7 (29)
Specialized Education					
2 Trade, craft and industrial training, technical education, engineering, architecture and town-planning	-	8.4 (6)	17.4 (9)	41.5 (24)	67.3 (39)
3 Agriculture, forestry, animal husbandry and veterinary programmes	-	8.3 (6)	13.3 (7)	21.0 (26)	42.6 (39)
4 Health-related, medical and paramedical programmes	- -	2.6 (2)	1.3 (1)	0.3 (1)	4.2 (4)
5 Commercial and business accountancy and book-keeping, and management training programmes	-	4.5 (2)	1.8 (2)	12.9 (8)	19.2 (12)
6 Community development, home economics, domestic science, nutrition and family planning programmes	-	4.2 (3)	0.9 (2)	19.9 (17)	25.0 (22)
Supporting Services					
7 Training of teachers and instructors	-	12.2 (7)	33.0 (11)	8.0 (7)	53.2 (25)
8 Curriculum development, libraries, in-service resource centres, printing and production of educational materials, media (radio and TV), etc.	-	-	-	44.2 (38)	44.2 (38)
9 Education administration, planning, statistics, etc.	-	-	-	2.2 (12)	2.2 (12)
Total	9.1 (4)	199.8 (44)	81.9 (34)	162.8 (138)	453.6 (220)

Categorizing by field, just over half (116) the new project items were in 'specialized education', a third in 'supporting services' (75), and the remainder (29) in 'general education'. The 'general education' project items, however, accounted for 43 per cent of the estimated total costs of new project items. Of the sub-fields in 'specialized education', the largest numbers of new project items (39 in each) were in 'agriculture, forestry, animal husbandry and veterinary programmes', and industrial technical/vocational education and training, followed by 'community development' and related areas (22). In the 'supporting services' field, the largest number of new project items (38) was in the complex, 'curriculum development, libraries, in-service resource centres, printing and production of educational materials, and media'.

The two most prominent features of the overall categorization of 'new' project items by level and field are the large items in second level general education and the numerous small items spread among all fields in the category 'not defined by level'. The second level general education items included U.S.$ 36.9 million to provide large integrated upper-primary/lower-secondary schools for consolidating scattered small rural schools in Malaysia, U.S.$ 16.6 million to establish educational complexes ('poles') accommodating secondary schools, vocational training, and non-formal education in Lebanon, and U.S.$ 15.6 million to establish schools at a proposed new intermediate level in Guyana. In the category 'not defined by level', the numerous small project items spread among all fields included literacy programmes in Pakistan and Malaysia, mobile units for craft and trade training in Afghanistan and Pakistan, farmer-training centres in El Salvador, Mauritania and Barbados, curriculum development centres in Guyana and Dominican Republic, educational materials production centres in Gabon and Somalia, and pre-investment studies for new services in Mauritania, Greece and Burundi.

Of the 231 'modification/improvement' project items, 115 and 65 respectively were in the 'second level' and 'not defined by level' categories, with 48 in the 'third level' and 3 in the 'first level' categories (Table IX). Over half (58 per cent) the estimated costs for 'modification/improvement' project items were accounted for by the 'second level' category. Classified by field, the project items were about equally divided between 'supporting services' and 'specialized education', with the remaining 23 per cent in 'general education'. Measured by estimated costs, the most prominent field was 'supporting services' (partly due to a large textbook project in the Philippines), followed by 'general education'. The latter featured some large second level project items, chiefly establishing facilities for practical studies in academic secondary education (e.g. Jordan, Burma, Tanzania). Other features of the overall distribution of 'modification/improvement' project items by level and field include: the number of small items (33) in 'educational administration, planning, statistics, etc.'; the number of items (43) in teacher training; and the numbers of items in 'agriculture, forestry, animal husbandry and veterinary programmes' (36), and industrial technical/vocational education (38).

Of the 192 'expansion' project items (Table X), the largest number were in the 'secondlevel' category (99), with almost equal numbers in the 'third level' (47) and 'not defined by level' (42) categories; there also were four 'first level' project items. Nearly 60 per cent of the estimated costs for 'expansion' project items were accounted for by 'second level' items, chiefly in general

education and teacher training. The 'not defined by level' items individually, in terms of costs, were on average much smaller than for the other levels. Classified by field, half the 'expansion' items (97) were in specialized education, notably the category 'trade, craft and industrial training, technical education, engineering, architecture and town-planning'. This field also was large in terms of estimated costs.

TABLE IX

'Modification/Improvement' Project Items by Level and Field
(US$ million)

(Number of Project Items in Parentheses)

Field	First Level	Second Level	Third Level	Not Defined By Level	Total
General Education					
1 Literacy, functional literacy, general education, general arts and sciences, social sciences, practical studies in general education	1.8 (3)	153.6 (47)	15.5 (3)	-	170.9 (53)
Specialized Education					
2 Trade, craft and industrial training, technical education, engineering, architecture and town-planning	-	27.5 (28)	61.0 (6)	1.5 (4)	90.0 (38)
3 Agriculture, forestry, animal husbandry and veterinary programmes	-	10.4 (19)	11.4 (13)	0.6 (4)	22.4 (36)
4 Health-related, medical and paramedical programmes	-	0.6 (1)	2.2 (2)	-	2.8 (3)
5 Commercial and business accountancy and book-keeping, and management training programmes	-	1.3 (2)	1.0 (1)	1.7 (5)	4.0 (8)
6 Community development, home economics, domestic science, nutrition and family planning programmes	-	0.1 (1)	-	0.2 (1)	0.3 (2)
Supporting Services					
7 Training of teachers and instructors	-	79.2 (17)	16.1 (23)	2.0 (3)	97.3 (43)
8 Curriculum development, libraries, in-service resource centres, printing and production of educational materials, media (radio and TV), etc.	-	-	-	74.0 (15)	74.0 (15)
9 Education administration, planning, statistics, etc.	-	-	-	8.0 (33)	8.0 (33)
Total	1.8 (3)	272.7 (115)	107.2 (48)	88.0 (65)	469.7 (231)

TABLE X

'Expansion' Project Items by Level and Field
(US$ million)

(Number of Project Items in Parentheses)

Field	First Level	Second Level	Third Level	Not Defined By Level	Total
General Education					
1 Literacy, functional literacy, general education, general arts and sciences, social sciences, practical studies in general education	22.5 (4)	136.7 (30)	30.1 (7)	0.3 (1)	159.6 (42)
Specialized Education					
2 Trade, craft and industrial training, technical education, engineering, architecture and town-planning	-	64.5 (22)	38.2 (11)	27.4 (12)	130.1 (45)
3 Agriculture, forestry, animal husbandry and veterinary programmes	-	32.9 (23)	9.4 (6)	2.3 (6)	44.6 (35)
4 Health-related, medical and paramedical programmes	-	2.4 (3)	7.4 (3)	-	9.8 (6)
5 Commercial and business accountancy and book-keeping, and management training programmes	-	5.1 (5)	-	5.8 (2)	10.9 (7)
6 Community development, home economics, domestic science, nutrition and family planning programmes	-	-	0.5 (2)	1.1 (2)	1.6 (4)
Supporting Services					
7 Training of teachers and instructors	-	31.7 (16)	33.2 (18)	0.3 (1)	65.2 (35)
8 Curriculum development, libraries, in-service resource centres, printing and production of educational materials, media (radio and TV), etc.	-	-	-	10.3 (18)	10.3 (18)
9 Educational administration, planning, statistics, etc.	-	-	-	-	-
Total	22.5 (4)	273.3 (99)	118.8 (47)	47.5 (42)	462.1 (192)

Taking all three kinds of project items ('new', 'modification/improvement', and 'expansion') together, a number of features are prominent, whether in terms of educational level or in terms of educational field. First, in terms of level (Table XI), there is, of course, an almost complete absence of project items at the first level. At the second level, most of the project items are either for 'modification/improvement' or for 'expansion' of existing services or institutions, though the small number of 'new' items at the second level were individually much larger in terms of estimated costs. At the third level, the project items were distributed along the impact categories more evenly than at the second level, and in terms of costs the 'expansion' items tended to be larger. At the 'not defined' level, most of the items were 'new', and individually in terms of costs they generally were small.

TABLE XI

Classification of Project Items by Impact Characteristics and by Level of Education
(US.$ million)

(Number of Project Items in Parentheses)

Level	New	Modific./ Improv.	Expansion	Total
First	9.1 (4)	1.8 (3)	22.5 (4)	33.4 (11)
Second	199.8 (44)	272.7 (115)	273.3 (99)	745.8 (258)
Third	81.9 (34)	107.2 (48)	118.8 (47)	307.9 (129)
Not defined	162.8 (138)	88.0 (65)	47.5 (42)	298.3 (245)
Total	453.6 (220)	469.7 (231)	462.1 (192)	1,385.4 (643)

In terms of field (Table XII), 47 per cent of the project items were in specialized education, though only 34 per cent of estimated costs, while 19 per cent of the items were in general education with 40 per cent of estimated costs. Project items in supporting services accounted for 34 per cent of the total number of project items and 26 per cent of estimated costs. The general education items were most numerous in the 'modification/improvement', followed by the 'expansion' categories, while among 'specialized education' items the 'new' category was prominent. Among particular sub-fields of 'specialized education' the impact categories were fairly evenly balanced for both the 'agricultural' and 'industrial' groups. In the 'curriculum development, libraries, printing and production ... media' supporting services complex, 'new' items were prominent.

TABLE XII

Classification of Project Items by Impact Characteristics and by Field of Education
(US$ million)

(Number of Project Items in Parentheses)

Field	New	Modific./ Improv.	Expansion	Total
General Education				
1 Literacy, functional literacy, general education, general arts and sciences, social sciences, practical studies in general education	195.7 (29)	170.9 (53)	189.6 (42)	556.2 (124)
Specialized Education				
2 Trade, craft and industrial training, technical education, engineering, architecture and town-planning	67.3 (39)	90.0 (38)	130.1 (45)	287.4 (122)
3 Agriculture, forestry, animal husbandry and veterinary programmes	42.6 (39)	22.4 (36)	44.6 (35)	109.6 (110)
4 Health-related, medical and paramedical programmes	4.2 (4)	2.8 (3)	9.8 (6)	16.8 (13)
5 Commercial and business accountancy and book-keeping, and management training programmes	19.2 (12)	4.0 (8)	10.9 (7)	34.1 (27)
6 Community development, home economics, domestic science, nutrition and family planning programmes	25.0 (22)	0.3 (2)	1.6 (4)	26.9 (28)
Supporting Services				
7 Training of teachers and instructors	53.2 (25)	97.3 (43)	65.2 (35)	215.7 (103)
8 Curriculum development, libraries, in-service resource centres, printing and production of educational materials, media (radio and TV), etc.	44.2 (38)	74.0 (15)	10.3 (18)	128.5 (71)
9 Education administration, planning, statistics, etc.	2.2 (12)	8.0 (33)	-	10.2 (45)
Total	453.6 (220)	469.7 (231)	462.1 (192)	1,385.4 (643)

Justifications

All the project items can be classified according as to whether the justifications put forward in favour of them mainly were 'efficiency' or 'equity' rationales. Of course, most items would have components of both rationales. The 'efficiency' rationales generally were of two kinds, roughly classifiable according as to whether the immediate focus was internal or external to the service or institutions in question, the former including items like curriculum development and technical assistance for educational planning, while the latter would especially include items mainly concerned to increase the supply of trained manpower. Of course, the boundary between internal and external efficiency is somewhat arbitrary, since efforts to improve the internal efficiency of the educational or training process all would have as their ultimate objective an improvement in the quality or quantity, or both, of the output of the process. In the present paper, classification of the project items between internal and external efficiency is not undertaken.

Table XIII shows the breakdown of PIM-recommended project items by equity/efficiency justification and by field of education. Most (86 per cent) of the 643 projects were proposed mainly on the basis of 'efficiency' rationales, although this proportion has been rather less (80 per cent) in more recent years (1972-75). In only one field - the 'community development' complex - were a majority of the project items proposed on the basis of equity rationales, although in 'general education' the ' equity' items accounted for nearly one-third of the total number of items and about one-third of the estimated costs for the field.

The 'equity' rationales generally focused on the question of access, the project items being proposed usually to extend access to existing services by hitherto neglected population groups, or to initiate new services for them. In 'general education', the 'equity' items included literacy programmes in Sierra Leone and Syria, primary education development in Somalia, Dominican Republic, Morocco, and Burundi, and secondary education development in Ecuador, Guyana, and Korea. In certain cases, for example Somalia and Dominican Republic, an expansion of teacher training was a prerequisite for the 'equity' increase in 'general education' enrolments, so these teacher-training items also have been classified as 'equity' items. In Tanzania, prospective increases in primary enrolment necessitated a teacher-training item, classified as an 'equity' item though no item directly to assist the increase in primary enrolment was proposed. Taking into account this connection with teacher training, then about half the 'equity' items were concerned one way or another to improve access to general education, with most of the remaining half concerned with access to different sorts of specialized education.

TABLE XIII

Classification of Project Items by Justification and Field of Education
(US$ million)

(Number of Project Items in Parentheses)

Field	Efficiency	Equity	Total
General Education			
1 Literacy, functional literacy, general education, general arts and sciences, social sciences, practical studies in general education	371.0 (86)	184.9 (38)	555.9 (124)
Specialized Education			
2 Trade, craft and industrial training, technical education, engineering, architecture and town-planning	285.2 (117)	2.4 (5)	287.6 (122)
3 Agriculture, forestry, animal husbandry and veterinary programmes	106.6 (106)	3.0 (4)	109.6 (110)
4 Health-related, medical and para-medical programmes	15.9 (11)	0.9 (2)	16.8 (13)
5 Commercial and business accountancy and book-keeping, and management training programmes	34.2 (27)	-	34.2 (27)
6 Community development, home economics, domestic science, nutrition and family planning programmes	9.0 (10)	17.9 (18)	26.9 (28)
Supporting Services			
7 Training of teachers and instructors	185.0 (87)	30.8 (16)	215.8 (103)
8 Curriculum development, libraries, in-service resource centres, printing and production of educational materials, media (radio and TV), etc.	120.7 (65)	7.9 (6)	128.6 (71)
9 Educational administration, planning, statistics, etc.	10.1 (44)	- (1)	10.1 (45)
Total	1,137.7 (553)	247.8 (90)	1,385.5 (643)

Projects Prepared 1965-1975

Comparison with PIM Recommendations

Between May 1964 and June 1975 inclusive the total number of 'preparation missions' (PPM's), that is missions to assist member states in preparing formal requests for assistance from the World Bank, was 88, of which 12 were not organized by Unesco, another 34 were not preceded by a project identification mission (PIM), and another 7 did not finalize a government request document, thus leaving 35 preparation missions which provided assistance to countries on the basis of prior reports by PIM's. Tables XIV and XV summarize for each of these 35 countries the number of project items and their costs in the government requests and compare these statistics to the prior PIM recommendations. In summary, 75 per cent of the individual project items in the government requests can be said to correspond to items recommended in the prior PIM reports. If account is taken of estimated costs, then the figure is 82 per cent. Thus, the so-called 'PIM' project items in the requests tended to be larger than the 'non-PIM' items in the requests, as well as being more numerous. Looking at the matter from the other end: 60 per cent of the project items recommended in the PIM's were included in the requests, or 78 per cent if measured by estimated costs. Thus, the so-called 'PPM' items in the PIM's tended to be larger than the 'non-PPM' items in the PIM's, as well as being more numerous. Tracing all the above percentages over time reveals no significant trends.

In Table XV there is a particular feature concerning costs which should be noted: the U.S.$ 537.1 million total costs estimated at the PIM stage for those project items which were subsequently included in the government requests were substantially below the U.S.$ 710.7 million costs estimated at the PPM stage. This discrepancy was due partly to a tendency by governments to enlarge those project items they regarded favourably in the PIM reports and partly to inaccurate estimation at the identification stage.1/

Notwithstanding the large proportion of recommended project items which were included in the government requests, there is some interest in examining by field and level those recommended items which were not included in the requests. In the period 1972-75, for example, out of the 80 items recommended by the prior PIM reports, 43 were not included in the requests. A distinctive feature is that in only one instance (Guyana) did the government exclude from its request a recommended item in general education, and even then it was a question of the government substituting another (higher) level of general education for that recommended by the PIM. Twenty-five out of the 43 PIM-recommended items not included in the requests were in the 'supporting services' and non-formal education categories, and included many of the more experimental, or innovative items.

1/ It has not normally been the practice for an architect to participate at the identification stage.

TABLE XIV

Project Items in Government Requests (PPM's)
Compared to Project Items in Prior PIM's

Date	Country	No. of PPM Project Items			No. of PIM Project Items		
		Total	of which in PIM	(2)/(1)	Total	of which in PPM	(5)/(4)
		(1)	(2)	(3)	(4)	(5)	(6)
7/66	Nicaragua	5	3	0.60	7	3	0.43
6/67	Guatemala	3	3	1.00	8	3	0.38
7/67	Ecuador	5	5	1.00	5	5	1.00
1/68	Zambia	10	8	0.80	12	8	0.67
5/68	Chile	3	3	1.00	5	3	0.60
8/69	Iran	7	5	0.71	6	5	0.83
10/69	Congo	4	3	0.75	5	3	0.60
1/70	Uganda	9	7	0.78	7	7	1.00
2/70	Senegal	11	9	0.82	10	9	0.90
3/70	Jordan	7	3	0.43	8	3	0.37
3/70	Somalia	4	3	0.75	4	3	0.75
4/70	Turkey	7	6	0.86	8	6	0.75
9/70	Morocco	15	12	0.80	21	12	0.57
11/70	Thailand	7	7	1.00	13	7	0.54
11/70	Ghana	12	9	0.75	13	9	0.69
1/71	Liberia	7	6	0.86	7	7	1.00
2/71	C.A.R.	4	4	1.00	4	4	1.00
5/71	Iraq	9	9	1.00	11	9	0.82
6/71	Malaysia	5	1	0.20	12	1	0.13
6/71	Philippines	7	7	1.00	9	7	0.78
10/71	Cameroon	11	11	1.00	16	11	0.69
11/71	Lebanon	6	5	0.83	5	5	1.00
4/72	Costa Rica	10	3	0.30	7	3	0.43
5/72	Madagascar	7	5	0.71	9	5	0.56
5/72	Peru	2	2	1.00	5	2	0.40
10/72	Mali	4	3	0.75	7	3	0.43
2/73	Honduras	6	5	0.83	11	5	0.45
9/73	Yemen, P.D.R.	7	5	0.71	7	5	0.71
2/74	Ecuador	3	3	1.00	9	3	0.33
5/74	Guyana	7	3	0.43	10	4	0.40
6/74	Dominican Rep.	8	6	0.75	10	6	0.60
1/75	Pakistan	9	7	0.78	11	7	0.64
2/75	Morocco	8	4	0.50	8	4	0.50
2/75	Philippines	11	7	0.64	11	7	0.64
4/75	Tanzania	4	2	0.50	7	2	0.29
	Total	244	184	0.75	308	184	0.60

TABLE XV

Project Items in Government Requests (PIM's) Compared to Project Items in Prior PIM's
(US$ million)

Date	Country	PPM Costs			PIM Costs		
		Total	Project Items in PIM	(2)/(1)	Total	Project Items in PPM	(5)/(4)
		(1)	(2)	(3)	(4)	(5)	(6)
7/66	Nicaragua	12.3	8.6	0.70	8.7	6.0	0.69
6/67	Guatemala	10.5	10.5	1.00	8.9	1.8	0.20
7/67	Ecuador	8.2	8.2	1.00	7.8	7.8	1.00
1/68	Zambia	94.5	88.5	0.94	37.0	33.3	0.90
5/68	Chile	20.9	20.9	1.00	53.5	46.9	0.88
8/69	Iran	37.1	24.3	0.65	15.0	9.6	0.64
10/69	Congo	6.5	5.4	0.83	7.9	4.4	0.56
1/70	Uganda	17.1	13.1	0.77	15.0	15.0	1.00
2/70	Senegal	7.4	7.4	1.00	8.7	8.4	0.97
3/70	Jordan	9.2	5.1	0.55	9.2	4.6	0.50
3/70	Somalia	5.6	3.2	0.57	3.6	2.2	0.61
4/70	Turkey	41.6	38.9	0.94	13.6	12.6	0.93
9/70	Morocco	20.4	16.6	0.81	28.5	19.3	0.68
11/70	Thailand	32.0	32.0	1.00	34.3	18.7	0.55
11/70	Ghana	22.9	16.7	0.73	21.0	15.5	0.74
1/71	Liberia	10.3	10.1	0.98	6.3	6.3	1.00
2/71	C.A.R.	5.4	5.4	1.00	5.2	5.2	1.00
5/71	Iraq	12.8	12.8	1.00	12.9	11.0	0.85
6/71	Malaysia	24.2	1.1	0.05	15.2	1.7	0.11
6/71	Philippines	22.2	22.2	1.00	22.5	21.0	0.93
10/71	Cameroon	13.4	13.4	1.00	18.6	15.5	0.83
11/71	Lebanon	17.1	11.1	0.65	10.8	10.8	1.00
4/72	Costa Rica	14.9	7.7	0.52	8.7	2.8	0.32
5/72	Madagascar	8.8	6.3	0.72	5.8	3.5	0.60
5/72	Peru	29.2	29.2	1.00	65.6	63.2	0.96
10/72	Mali	3.4	3.4	1.00	5.1	3.1	0.61
2/73	Honduras	8.1	6.2	0.77	6.7	4.1	0.61
9/73	Yemen, P.D.R.	8.9	7.6	0.85	5.6	5.0	0.89
2/74	Ecuador	46.8	46.8	1.00	19.6	17.0	0.87
5/74	Guyana	23.7	7.5	0.32	20.7	15.6	0.75
6/74	Dominican Rep.	33.5	32.3	0.96	10.0	7.9	0.79
1/75	Pakistan	26.5	24.8	0.94	18.3	16.8	0.92
2/75	Morocco	94.2	55.0	0.58	37.3	24.7	0.66
2/75	Philippines	95.5	91.0	0.95	90.6	85.0	0.94
4/75	Tanzania	24.0	17.4	0.73	29.6	10.8	0.36
	Total	869.1	710.7	0.82	687.8	537.1	0.78

In each of the three instances where a project item in curriculum development was recommended by the PIM it was not included in the request: similarly for both instances of a project item in educational planning and administration and both instances of a project item in educational media (radio). Also left out of the requests were items for an experimental adult education programme, mobile training units in rural areas, rural handicrafts centres, rural activity centres, agricultural research, a study of the structure of secondary education and the expansion and rationalization of primary school resources, a programme to establish cooperative education centres, and two items for training paramedical personnel. However, it is not necessarily the case that these excluded items indicate systematic educational policy choice factors. There are agency factors involved, mainly that technical assistance can be obtained free from UNDP. Thus PIM-recommended project items which might have large technical assistance components, such as curriculum development items, often are not included in government requests to the World Bank.1/

Comparison of Prepared Projects with Projects finally agreed between Governments and the Bank

Out of the 35 government requests examined above, 28 eventually resulted in projects signed into agreement with the World Bank. The project items in the corresponding 28 Bank appraisal reports therefore can be compared with those requested by the governments. In sum, 80 per cent of the project items in the appraisal reports can be said to correspond to items in the prior government requests (Table XVI); and if account is taken of estimated costs, then the figure is 95 per cent (Table XVII). Comparing the 'unrequested' project items with the rejected 'requested' items, no clear general patterns emerge, though the former category does include pre-investment/feasibility studies and assistance for educational planning, while only one 'requested' study (educational management study - Philippines) was rejected. Similarly, the rejected 'requested' items include a number of university-level higher education institutions, while only in one instance (Faculties of Education - Iran) were such institutions among the 'unrequested' items.

1/ This is an appropriate place to note that it is frequently the case that PIM-recommended project items are requested from bilateral and multilateral agencies other than the World Bank. Thus the proportion of all PIM-recommended items that eventually are requested from one or another external agency might well be as high as two-thirds, as compared to 60 per cent if only the World Bank is taken into account. Comprehensive data on other multilateral and bilateral assistance to PIM-recommended items are not available.

TABLE XVI

Project Items in IBRD Appraisals (APP's) Compared to Project Items in Prior PIM's and PPM's for all those Countries which had an APP and Unesco PIM and PPM

Date of PPM	Country	Number of Appraisal Project Items 1/					Number of PIM Project Items				
		Total	of which in PPM	(2)/(1)	of which in PIM	(4)/(1)	Total	of which in PPM	(7)/(6)	of which in APP	(9)/(6)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
7/66	Nicaragua	3	3	1.00	2	0.67	7	3	0.43	2	0.29
6/67	Guatemala	3	3	1.00	3	1.00	8	3	0.38	3	0.38
7/67	Ecuador	4	4	1.00	4	1.00	5	5	1.00	4	0.80
1/68	Zambia	5	4	0.80	4	0.80	12	8	0.68	4	0.33
5/68	Chile	2	2	1.00	2	1.00	5	3	0.60	2	0.40
8/69	Iran	7	5	0.71	5	0.71	6	5	0.83	5	1.00
10/69	Congo	4	4	1.00	3	0.75	5	3	0.60	3	0.60
1/70	Uganda	7	5	0.71	5	0.71	7	7	1.00	5	0.71
2/70	Senegal	4	3	0.75	4	1.00	10	9	0.90	4	0.40
3/70	Jordan	5	5	1.00	2	0.40	8	3	0.38	2	0.25
3/70	Somalia	4	3	0.75	2	0.50	4	3	0.75	2	0.50
4/70	Turkey	7	6	0.86	6	0.86	8	6	0.75	6	0.75
9/70	Morocco	8	8	1.00	8	1.00	21	12	0.57	8	0.38
1/71	Liberia	8	6	0.75	5	0.63	7	7	1.00	5	0.71
2/71	C.A.R.	5	1	0.20	1	0.20	4	4	1.00	1	0.25
5/71	Iraq	8	8	1.00	8	1.00	11	9	0.82	8	0.73
6/71	Malaysia	5	5	1.00	1	0.20	12	1	0.09	1	0.09
6/71	Philippines	10	5	0.50	5	0.50	9	7	0.78	5	0.56
10/71	Cameroon	8	6	0.75	7	0.88	16	11	0.69	7	0.44
11/71	Lebanon	5	4	0.80	3	0.60	5	5	1.00	3	0.60
4/72	Costa Rica	3	3	1.00	2	0.67	7	3	0.43	2	0.29
5/72	Peru	3	2	0.67	2	0.67	5	2	0.40	2	0.40
10/72	Mali	5	4	0.80	3	0.60	7	3	0.43	3	0.43
2/73	Honduras	9	6	0.67	5	0.56	11	5	0.45	5	0.45
9/73	Yemen, P.D.R.	7	7	1.00	6	0.86	7	5	0.71	6	0.86
2/74	Ecuador	1	1	1.00	1	1.00	9	3	0.33	1	0.11
5/74	Guyana	8	6	0.75	3	0.38	10	4	0.40	3	0.30
6/74	Dominican Rep.	5	4	0.80	4	0.80	10	6	0.60	4	0.40
	Total	153	123	0.80	106	0.70	236	145	0.61	106	0.45

Note: 1/ Excluding project implementation units.

TABLE XVII

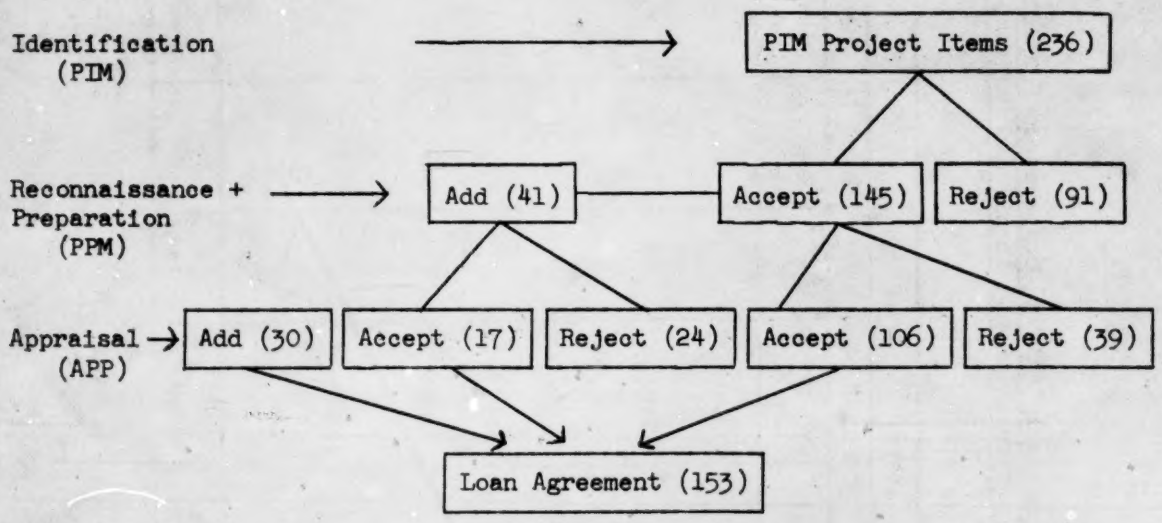
Project Items in IBRD Appraisals (APP's) Compared to Project Items in Prior PIM's and PPM's for all those Countries which had an APP and Unesco PIM and PPM
(US$ million)

Date of PPM	Country	Costs of Appraisal Project Items 1/					Costs of PIM Project Items				
		Total	of which in PPM	(2)/(1)	of which in PIM	(4)/(1)	Total	of which in PPM	(7)/(6)	of which in APP	(9)/(6)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
7/66	Nicaragua	8.0	8.0	1.00	5.7	0.71	8.7	6.0	0.69	3.6	0.41
6/67	Guatemala	11.6	11.6	1.00	11.6	1.00	8.9	1.8	0.20	1.8	0.20
7/67	Ecuador	7.8	7.8	1.00	7.8	1.00	7.8	7.8	1.00	6.4	0.82
1/68	Zambia	36.2	35.1	0.97	35.1	0.97	37.0	33.3	0.90	22.5	0.61
5/68	Chile	12.5	12.5	1.00	12.5	1.00	53.5	46.9	0.88	8.9	0.17
8/69	Iran	33.5	29.2	0.87	32.5	0.97	15.0	9.6	0.64	15.0	1.00
10/69	Congo	3.1	3.1	1.00	2.6	0.84	7.9	4.4	0.56	4.4	0.56
1/70	Uganda	8.1	6.1	0.75	6.1	0.75	15.0	15.0	1.00	10.2	0.68
2/70	Senegal	1.8	1.7	0.94	1.8	1.00	8.7	8.4	0.97	1.6	0.18
3/70	Jordan	6.8	6.8	1.00	3.1	0.46	9.2	4.6	0.50	4.2	0.46
3/70	Somalia	2.6	2.6	1.00	1.0	0.38	3.6	2.2	0.61	2.2	0.61
4/70	Turkey	15.1	15.1	1.00	15.1	1.00	13.6	12.6	0.93	11.1	0.82
9/70	Morocco	10.7	10.7	1.00	10.7	1.00	28.5	19.3	0.68	18.3	0.64
1/71	Liberia	7.0	6.5	0.93	6.1	0.87	6.3	6.3	1.00	6.2	0.98
2/71	C.A.R.	4.4	0.4	0.09	0.4	0.09	5.2	5.2	1.00	0.7	0.13
5/71	Iraq	16.7	16.7	1.00	16.7	1.00	12.9	11.0	0.85	9.6	0.74
6/71	Malaysia	22.8	22.8	1.00	0.9	0.04	15.2	1.7	0.11	0.9	0.06
6/71	Philippines	14.5	12.3	0.85	12.3	0.85	22.5	21.0	0.93	10.2	0.45
10/71	Cameroon	8.4	7.0	0.83	8.4	1.00	18.6	15.5	0.83	12.6	0.68
11/71	Lebanon	12.6	12.6	1.00	5.9	0.47	10.8	10.8	1.00	3.7	0.34
4/72	Costa Rica	7.4	7.4	1.00	4.9	0.66	8.7	2.8	0.32	2.7	0.31
5/72	Peru	31.1	31.1	1.00	31.1	1.00	65.6	63.2	0.96	63.2	0.96
10/72	Mali	4.9	4.5	0.92	4.4	0.90	5.1	3.1	0.61	3.1	0.61
2/73	Honduras	6.8	6.2	0.91	4.3	0.63	6.7	4.1	0.61	4.1	0.61
9/73	Yemen, P.D.R.	3.0	3.0	1.00	2.9	0.97	5.6	5.0	0.89	5.0	0.89
2/74	Ecuador	5.8	5.8	1.00	5.8	1.00	19.6	17.0	0.87	3.7	0.19
5/74	Guyana	12.3	12.1	0.98	2.5	0.20	20.7	15.6	0.75	1.3	0.06
6/74	Dominican Rep.	8.7	8.4	0.97	8.4	0.97	10.0	7.9	0.79	6.9	0.69
	Total	324.2	307.1	0.95	260.6	0.80	450.9	362.1	0.80	244.1	0.54

Note: 1/ Excluding costs of project implementation units and contingencies.

Comparison of PIM-Recommended Projects with Projects finally agreed between Governments and the Bank

The 28 projects considered above can now be examined over the entire cycle from PIM recommendations through to loan agreement. The cycle resembles a filtering/refining process, with the PIM recommending a large number of project items (236), of which a selection (145) enter government requests where they are joined by other items (41) to constitute a 'requested' batch (186), of which another selection (123) joins a final group of 'unrequested' items (30) to reach loan agreement (153). Diagramatically, the process is as follows:



Out of the 153 project items in the final loan agreements, 70 per cent (106) (column (5) of Table XVI) were recommended by the original Unesco identification reports, or 80 per cent (column (5) of Table XVII) if account is taken of estimated costs (i.e. the 'weight' of the items in the appraisal reports).

Aside from the 28 projects above which passed through the full PIM/PPM/APP cycle, there also were 11 projects which reached loan agreement without passing through a separate PPM stage. The project items recommended by the PIM's for these 11 projects are compared to the items in the corresponding appraisal reports in Table XVIII. The project items recommended by the grand total of 39 PIM's which were subsequently followed either by a PPM and an APP or by an APP only are compared to the items in the corresponding appraisal reports in Table XIX. For this grand total the proportion of appraisal items which were recommended by prior PIM reports was 64 per cent (Column (3) of Table XIX) or 78 per cent (column (6) of Table XIX) if measured by project costs (i.e. the 'weight' of the items in the appraisal reports).

TABLE XVIII

Project Items in IBRD Appraisals (APP's) Compared to Project Items in Prior PIM's for all those countries which had an APP and UNESCO PIM but no PPM

Country	Appraisal Project Items						PIM Project Items					
	Number			Costs (US$m)			Number			Costs (US$m)		
	Total	of which in PIM	(2)/(1)	Total	of which in PIM	(5)/(4)	Total	of which in APP	(8)/(7)	Total	of which in APP	(11)/(1
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Chad	2	-	-	3.9	-	-	1	-	-	0.8	-	-
Taiwan	4	3	0.75	13.0	12.9	0.99	6	3	0.50	13.4	10.0	0.75
El Salvador I	3	3	1.00	5.8	5.8	1.00	6	3	0.50	13.6	10.8	0.79
Korea I	5	4	0.80	26.0	25.6	0.98	5	4	0.80	22.6	16.0	0.71
Nigeria	4	3	0.75	82.1	82.0	1.00	11	3	0.27	137.3	87.1	0.63
Mauritania	7	4	0.57	3.2	2.1	0.66	4	4	1.00	3.7	3.7	1.00
Sierra Leone	7	2	0.29	7.5	2.1	0.28	9	2	0.22	4.5	0.8	0.18
El Salvador II	3	-	-	17.1	-	-	12	-	-	7.3	-	-
Somalia	5	2	0.40	7.0	1.1	0.16	10	2	0.20	8.1	4.6	0.57
Gabon	7	3	0.43	5.5	3.3	0.60	9	3	0.33	16.9	7.1	0.42
Korea II	6	1	0.17	28.0	14.8	0.53	9	1	0.11	26.9	4.3	0.16
Total	53	25	0.47	199.1	149.7	0.75	82	25	0.30	255.1	144.4	0.57

TABLE XIX

Project Items in IBRD Appraisals (APP's) Compared to Project Items in Prior PIM's for all those countries which had an APP and Unesco PIM

By Cycle	Appraisal Project Items						PIM Project Items					
	Number			Costs (US$m)			Number			Costs (US$m)		
	Total	of which in PIM	(2) (1)	Total	of which in PIM	(5) (4)	Total	of which in APP	(8) (7)	Total	of which in APP	(11) (10)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
PIM/APP	53	25	0.47	199.1	149.7	0.75	82	25	0.30	255.1	144.4	0.57
PIM/PPM/APP	153	106	0.70	324.2	260.6	0.80	236	106	0.45	450.9	244.1	0.54
Total	206	131	0.64	523.3	410.3	0.78	318	131	0.41	706.0	388.5	0.55

Economic Parameters of the Identification and Appraisal Processes

Notwithstanding the 'filtering' of projects as between the identification and appraisal stages of the project cycle, the identification and appraisal processes themselves, regarded as economic decision-making mechanisms, have certain properties in common. A basic requirement for a valid programme of identifying the needs and preferences of the countries concerned would be that the collection of projects recommended by each Unesco project identification mission (PIM) in a succession of PIM's to a number of different countries should be in some sense 'independent' of each and every preceding missi 's collection, like the outcome of each toss in a succession of tosses of a fai coin. Another requirement would be that the on-going programme or 'process' of PIM's should be in some sense 'stable', that is, it should contain an element of consistency in its treatment of different countries, much as the probability of heads on each successive toss of a fair coin is a 'stable' 0.5. Similar requirements would apply to World Bank appraisal missions (APP's). Each country's particular circumstances would be supposed, within rather wide limits, to be unique, so that from one country to another what would be regarded as priority projects worth financing would be quite unconnected, although from one country to the next the basic criteria would be supposed to be consistent.

The degree to which the on-going Unesco and Bank programmes of identification and appraisal actually satisfy these requirements is difficult to test empirically. The problem is that of defining a statistical process or model which would in principle embody the notions of 'independence' and 'stability' between successive PIM's, or APP's. Having defined such a process, the degree to which the observed process differed from it would then constitute a measure of the degree to which the on-going programme of identification or appraisal did not satisfy the hypotheses of 'independence' and 'stability'. The simplest and easiest classification to measure is total estimated costs, whether of each project or each project item, and for that reason it is adopted in the analysis which follows. Nevertheless, certain restraints are imposed on the analysis as a result, in particular on the extent to which purely educational, as distinct from the financial, characteristics of the project and project items can be discussed.

The analysis covers three different samples of projects and project items:

(a) all projects (71) and all project items (643) recommended by PIM's 1965-1975;

(b) all projects (39) and all project items (318) recommended by those PIM's which were followed by an APP 1965-1975;

(c) all projects (39) and all project items (206) recommended by those APP's which were preceded by a PIM 1965-1975.

The basic data for all three samples are given in Table XX. In addition, sample (a) for the project items, which are sufficiently numerous, is broken down chronologically into three successive time periods. Part of the interest of samples (b) and (c) is in whether a comparison of them will indicate significant differences between Unesco and the Bank in the underlying processes of identification and appraisal for an identical group of countries.

TABLE XX

Frequency Distributions of Sizes of Projects and Sizes of Project Items for three Samples of PIM and APP Reports 1965-1975: (a) all PIM Reports, (b) all PIM Reports which were followed by an Appraisal, and (c) all APP Reports which were preceded by a PIM

Frequency Distribution of Sizes of Projects

Size of Project (US$)	(a)	(b)	(c)1/
Less than 10 million	.45	.46	.56
10-19.9 million	.24	.30	.26
20-29.9 million	.16	.13	.08
30-39.9 million	.06	.03	.08
40-49.9 million	.01	-	-
50 million or more	.09	.08	.02
Total	1.00	1.00	1.00
n	71	39	39
Mean (u) US$ million	19.5	18.1	13.4

Frequency Distribution of Sizes of Project Items

Size of Project Item (US$)	1965-69	1969-72	1972-75	Total 1965-75	(b)	(c)1/
Less than 1 million	.55	.57	.55	.56	.52	.50
1-1.9 million	.20	.22	.19	.21	.24	.19
2-2.9 million	.11	.09	.08	.09	.09	.09
3-3.9 million	.04	.03	.05	.04	.06	.07
4-4.9 million	.01	.02	.03	.02	.02	.03
5-5.9 million	.02	.01	.02	.02	.01	.02
6-6.9 million	.03	-	.01	.01	.01	.02
7-7.9 million	-	-	.01	-	-	.02
8-8.9 million	-	.01	.01	.01	-	.01
9-9.9 million	-	.01	.01	-	.01	.01
10 million or more	.04	.04	.03	.04	.04	.04
Total	1.00	1.00	1.00	1.00	1.00	1.00
n	158	254	231	643	318	206
Mean (u) US$ million	2.2	2.0	2.2	2.2	2.2	2.5

1/ Excluding contingencies and costs of project implementation

Statistical Model of the Identification and Appraisal Processes

If a succession of PIM's or APP's is considered as a succession of trials, and if the underlying PIM or APP mechanism is a chance mechanism, then the sizes of the projects and project items thrown up by the mechanism after a fair number of trials should be observably distributed according to the laws governing random processes. Given that the two essential conditions of a random process, or chance mechnism, are (i) statistical independence as between the successive 'events' generated by the process, and (ii) a stable parameter, the problem arises as to whether there is any reason to believe that the on-going processes of identification and appraisal can be characterized a priori as random processes, where the events are represented by dollar costs of projects or project items.

The grounds for believing a priori that the condition of statistical independence applies are strong. A project of US.$ 20 million identified or appraised in Morocco in, say, the spring, has no influence on whether a subsequent project in, say, Algeria in the summer, or Ecuador or Thailand, is US.$ 20 million, or US.$ 50 million, or whatever. More formally, the conditional probability of an identified or appraised US.$ 50 million project in Algeria, Ecuador, or Thailand in the summer, given a US.$ 20 million project in Morocco in the spring, is the same as the probability of a US.$ 50 million project in Algeria, Ecuador, or Thailand, even before either the identification or appraisal trials have been run for Morocco. A similar argument can be made for the size-distribution of items within the Morocco project, on the one hand, and the Algeria, Ecuador, or Thailand projects on the other.

The grounds for believing that the condition of stability applies, however, are more obscure, because it is difficult to identify what it is that is stable. In other words, it is difficult to identify the analogue of the parameter $p = 0.5$, being the probability of heads, in a toss of a fair coin. At first sight, there is no figure which can be recognized a priori as being likely to constitute the underlying stable parameter of, say, the identification process, assuming that process to be a random process. And similarly for the appraisal process. The parameters sought are figures for project, or project item, size, such that their insertion into the identification and appraisal mechanisms, would, given that the successive events thrown up by a run of trials are statistically independent, generate distributions characterizable as having been generated by random processes. Of course, there may well be components that are stable in the on-going activities of identification and appraisal; but the unstable components, like changing policies towards basic education or rural development, personnel, the detail of project cycle procedures, and so on, seem to far outweigh identifiable stable ones.

It appears for the present, then, that while the condition of statistical independence can plausibly be established a priori, that of stability in the underlying parameters cannot. The discussion, therefore, will have to proceed as follows: given the condition of statistical independence, and assuming that the underlying identification and appraisal processes are random processes, then if the observed distributions of sizes of projects and sizes of project items differ significantly from distributions generated by random processes then the hypotheses that there are underlying stable parameters must be rejected, whereas if the differences between the observed and the random processes are not significant the hypotheses that there are underlying stable parameters cannot be rejected, whence reasons can then be sought to explain why the observed parameters should be accepted as both stable and inherently part of the identification and appraisal processes.

It shall initially be assumed, therefore, that the underlying identification and appraisal processes are random processes. But notwithstanding remarks made above about analogies with fair coins, neither the identification nor the appraisal process can be modeled by the Bernouli random process, because the identification and appraisal trials do not generate dichotomous outcomes. It is not open to each trial to either come up with a project or to come up with no project, in the way that a tossed coin may come up either heads or not-heads. Each trial must come up with a project.

The identification and appraisal processes, therefore, in so far as they are hypothesized to be random processes, must be characterized as continuous random processes, that is, as Poisson processes, in which total 'space', given by the dollar value of a succession of projects or project items is 'expanded' continuously to include new projects or project items. From this standpoint, the 'distance' t between one identification, or appraisal, and the next, is considered as a random variable representing the size of the later of the two projects, or project items as the case may be, and the underlying stable parameter u is the mean project or project item size. The limiting form of the distribution generated by this process will be an exponential distribution:

$$P(t) = \frac{1}{u} e^{\frac{-t}{u}}$$

where $P(t)$ represents probability per unit of dollar 'space'.

Tests of the Model

The question now arises as to whether the observed distributions can be said to differ significantly from the exponential distributions which would be generated if the identification and appraisal processes were Poisson processes with stable parameters given by the mean project and project item sizes. But it is first necessary that criteria for significance be specified. Two arbitrary restrictive criteria are proposed:

(i) the observed distribution shall be said to differ significantly from the exponential, or 'ideal', distribution if there is more than one 'order reversal' between any two points in the observed distribution: the observed distribution, in other words, should be a decreasing function of project or project item size, except for the right tail points where small numbers of large projects or project items would be lumped together;

(ii) there should not be more than two instances of a difference greater than 0.05 between any two parallel pair of points on the observed and exponential distributions.

Taking the project sizes and project item sizes in turn, and testing for significant differences between the observed and exponential distributions, the results are as follows:

(i) Sizes of Projects: There are no significant differences between the observed and exponential distributions for any of the three samples of projects. The figures for the three pairs of distributions are shown below:

(a) All PIM's		(b) PIM's which were followed by an APP		(c) APP's which were preceded by a PIM	
Observed	Exponential	Observed	Exponential	Observed	Exponential
.45	.40	.46	.42	.56	.51
.24	.24	.30	.24	.26	.24
.16	.14	.13	.14	.08	.12
.06	.09	.03	.08	.08	.05
.01	.05	-	.04	-	.03
.09	.08	.08	.08	.02	.05

Measuring by the average of the absolute pair-wise differences between observed and exponential distributions, the best 'fit' would appear to be the identification process for All PIM's, though there is not really much difference between that process and the other two, which, interestingly, have identical 'fits', notwithstanding that there is a significant difference between their underlying parameters - the mean appraisal project being US.$ 13.4 million compared to the corresponding identification mean of US.$ 18.1 million (Table I).

(ii) Sizes of Project Items: There are no significant differences between the observed and exponential distribution for any of the three samples of projects. The figures for the three pairs of distributions are shown below:

(a) All PIM's		(b) PIM's which were followed by an APP		(c) APP's which were preceded by a PIM	
Observed	Exponential	Observed	Exponential	Observed	Exponential
.56	.36	.52	.36	.50	.33
.21	.23	.24	.23	.19	.22
.09	.15	.09	.15	.09	.15
.04	.09	.06	.09	.07	.10
.02	.06	.02	.06	.03	.07
.02	.04	.01	.04	.02	.04
.01	.02	.01	.02	.02	.03
-	.02	-	.02	.02	.02
.01	.01	-	.01	.01	.01
-	.01	.01	.01	.01	.01
.04	.01	.04	.01	.04	.02

Measuring by the average of the absolute pair-wise differences between observed and exponential distributions, the best 'fit' would appear to be shared jointly by the appraisal and corresponding PIM processes, between which the difference in 'fit' coefficients (3.5 compared to 3.6) is negligible, notwithstanding that there is a difference between their underlying parameters - the mean appraisal project item being US.$ 2.5 million compared to the corresponding identification mean of US.$ 2.2 million (Table XX). A peculiarity in all the pairs of distributions is the observation point corresponding to the small 'less than US.$ 1 million' project items, at which the observed frequencies are distinctly over-represented.

The hypothesis that Unesco education project identification and World Bank education project appraisal processes both are random processes, or chance mechanisms, at least as regards sizes of projects and project items, is not rejected by the data. Indeed, the random process model fits the data well enough that there almost certainly is available an intuitively plausible, though hitherto hidden, sound explanation for the stability of the observed parameters.

Consider first the mean project sizes: roughly US.$ 13.4 million for the Bank and roughly US.$ 18.1 million for Unesco, the difference explained mainly by the tendency for Unesco missions to identify projects over and above what is thought likely to be financed by the Bank. What might be operating in both organizations is a project size norm; in other words, an ideal project size, which over time has established itself as an inert datum in the collective behaviour of both organizations, and which simply embodies a response to experience and the requisites of the Bank's lending programme, administrative feasibility, supervision, report-writing, mission time in the field, and so on. Over time, of course, there will be deviations around the norm, but from one country to the next it will represent a stable reference point as to what constitutes a 'bankable', ideal, project size, with Unesco adhering to a higher norm than the Bank.

The counter-argument might be advanced, however, that the stability of the parameters actually arises not from anything that has become embedded in the operations of the two organizations, but from some feature or features pertaining to the countries covered by the identification and appraisal processes.

Intuitively, the most plausible set of counter-arguments is that projects are 'allocated' on the basis, say, of population or GNP. From this standpoint, that which is 'stable' is simply the mean of project size per unit of population or of GNP, and an 'allocation' model, rather than a random process one, would constitute the true explanation for the observed distributions of sizes of projects. In addition, it might be argued, since large project items tend to be associated with large projects, the 'allocation' model also would explain the observed distributions of sizes of project items.

These arguments are not readily supported by the data. If each country in each category of project size is weighted alternatively by its population and GNP, then distributions of population and GNP frequencies respectively are generated which have poor fits with the observed distributions of project frequencies, as shown overleaf:

(a) All PIM's			(b) PIM's which were followed by an APP			(c) APP's which were preceded by a PIM		
Projects	Pop.	GNP	Projects	Pop.	GNP	Projects	Pop.	GNP
.45	.14	.16	.46	.13	.11	.56	.19	.15
.24	.[illegible]	.30	.30	.34	.43	.26	.34	.40
.16	.13	.20	.13	.29	.26	.08	.18	.19
.06	.20	.12	.03	.01	.01	.08	.12	.19
.01	.12	.02	-	-	-	-	-	-
.09	.19	.20	.08	.23	.19	.02	.19	.07

The population and GNP distributions appear to have more in common with each other than either has with its corresponding project's distribution.

The random process model, then, stands up quite well on these simple tests of counter-arguments. Furthermore, it is by no means an implausible idea to postulate that to the extent that 'information' about population and GNP is actually relevant to the identification and appraisal processes, then this 'information' has been embodied in the parameters of the hypothesized random processes.

In so far as the two sets of parameters will remain stable or, if not, will change in a foreseeable manner, than from a knowledge of these parameters alone and for any given US.$ 1 billion worth of future programmes, the numbers and sizes of projects and project items which will be identified or appraised are predictable from an application of the equation for the exponential distribution given above: for example, the Bank will appraise 4 projects in the size-category US.$ 30 - US.$ 30.9 million, and 60 project items in the size-category US.$ 2 - US.$ 2.9 million, the corresponding figures for Unesco being 5 and 68 respectively.

A difficulty with all the above discussion is that the so-called 'testing' for significant differences between the observed and exponential distributions was not, of course, a testing for significant differences between the observed distributions and distributions generated by random process models estimated as least-squares best fits to the observed distributions. Although there are no established procedures to follow for the latter kind of testing, because the models are non-linear, and the usual F-tests for regression and lack of fit are not valid, it is nevertheless of interest to estimate the least-squares best fit random process models, and then to compare their parameters with the corresponding observed mean sizes of projects and project items. For, notwithstanding the conclusions to the effect that the distributions generated by the observed mean sizes of projects and project items were not significantly different from the observed distributions, it might still remain that there are alternative parameters which generate distributions with even better fits to the observed distributions and, if so, that these alternative parameters are more appropriately recognised as the 'true' parameters of the identification and appraisal processes.

Accordingly, it is postulated that a random process model of the form

$$P(t) = \frac{1}{u} e^{-\frac{t}{u}}$$

will suitably account for the variation observed in the data on sizes of projects and project items, and u remains to be found by the method of least-squares estimation. Thus, for each distribution given in Table XX there will be a u which gives a least-squares best fit of the above model, and which can be compared with the corresponding observed mean size of projects or project items.

The least-squares best fit (LSBF) estimates of the u's are obtained by iteration, and are shown below, where they are compared to the observed mean sizes of projects and project items for each distribution:

U8.$ million	(a) All PIM's	(b) PIM's which were followed by an APP	(c) APP's which were preceded by a PIM
Sizes of Projects			
u LSBF	16.5	16.0	12.0
u Observed	19.5	18.1	13.4
Sizes of Project Items			
u LSBF	1.1	1.3	1.4
u Observed	2.2	2.2	2.5

That the basic model is, in a statistical sense, a 'good' one is shown in Table XXI, where the LSBF distributions are compared to the observed distributions. Indeed, the 'fit' for one of the distributions - sizes of project items in those PIM's which were followed by an APP - is virtually perfect. Still, in general the LSBF u's above are quite different from the observed mean sizes of projects and project items, from which it follows that in practical application of the model, for example for purposes of prediction, it is probably wiser to use the LSBF u's rather than the observed mean sizes of projects and project items as was done in the initial discussion.

TABLE XXI

Observed Distributions of Sizes of Projects and Project Items Compared to Distributions Generated by a Random Process Model Fitted by the Method of Least-Squares Estimation

(a) All PIM's		(b) PIM's which were followed by an APP		(c) APP's which were preceded by a PIM	
Observed	LSEF	Observed	LSEF	Observed	LSEF
		Sizes of Projects			
.45	.45	.46	.46	.56	.55
.24	.24	.30	.24	.26	.24
.16	.13	.13	.13	.08	.10
.06	.07	.03	.07	.08	.05
.01	.04	-	.04	-	.02
.09	.07	.08	.06	.02	.04
		Sizes of Project Items			
.56	.57	.52	.52	.50	.50
.21	.23	.24	.24	.19	.24
.09	.09	.09	.11	.09	.11
.04	.04	.06	.05	.07	.06
.02	.02	.02	.02	.03	.03
.02	.01	.01	.01	.02	.01
.01	-	.01	.01	.02	.01
-	-	-	-	.02	-
.01	-	-	-	.01	-
-	-	.01	-	.01	-
.04	.04	.04	.04	.04	.04

Concluding Remarks

In relation to the countries concerned to obtain finance for education projects, a 'valid', or 'legitimate', identification or appraisal process can be defined operationally as a process having the properties of statistical independence and stability, that is, as a random process, or chance mechanism. The observed distributions of sizes of projects and project items generated by the identification and appraisal processes during the period 1965-75 are not inconsistent with hypotheses that the identification and appraisal processes are random processes with parameters given by the mean sizes of projects and project items. The property of statistical independence is established a priori, and the property of stability in the parameters has a plausible intuitive explanation in terms of stable norms as to what sizes of projects and project items are 'bankable'.

That said, the observed parameters have not clear independent economic or educational rationale. Of course, this is not to propose that education project identification and appraisal are simply matters of throwing money at the problems, so to speak, but only that the units thrown obey the laws of probability rather than, say, those of economics. What they should be thrown at and why, would appear to be the substantive questions at identification and appraisal. Or, from the standpoint of economics, the decision-making process at identification and appraisal, notwithstanding slightly different emphases by Unesco and the Bank, would appear to be one in which the problem is that of identifying and appraising those investments with potentially the highest rates of social return subject to underlying process parameters on sizes of projects and project items. If true this does, of course, significantly modify the view of educational investment decision-making prevalent in most professional discussion of the economics of education and educational planning.